Entomologist's Gazette

ly, 1956 Vol. 7, No. 3

CONTENTS

ENTOMOLOGIST'S GAZETTE

July, 1956 Vol. 7, No. 3

All communications to the Editor, 22 Harlington Road East, Feltham, Middlesex, England. Telephone Feltham 3740.

ENTOMOLOGIST'S GAZETTE is published Quarterly in January, April, July and October. The Subscription Rate is one pound per year. For Advertising rates apply to The Editor.

NEWS AND VIEWS

The fine paper AN ILLUSTRATED LIST OF BRITISH TORTRICIDAE, Part 1. TORTRICINAE AND SPARGANOTHINAE, by J. D. Bradley and and E. L. Martin, which appears in this number, is being published in conjunction with Messrs. Coridon Press, of 9 Devonshire Road, Harrow, Middlesex—from whom copies may be obtained at 6s. each plus 6d. postage and packing. Coridon Press can also supply copies of a Cabinet Label List of the species of British Tortricinae and Sparganothinae at 1s. 3d. post free—or 1s. if ordered with the former.

The Council for the Promotion of Field Studies has this year again arranged, at Juniper Hall Field Centre, some courses of real interest and value to entomologists. They are as follows:

Field Course in Invertebrate Zoology (especially insects)
11th-18th July. For Undergraduates, Specialist Amateurs, Museum Officers and Teachers with some Zoological knowledge.

Beginner's Entomology Course
25th July-1st August.

Natural History Course
22nd-29th August. No special knowledge required; all welcome. A general course based on the local ecology.

The Inclusive fee for each course is Six Guineas. Further particu-

lars can be obtained from the Warden, Juniper Hall Field Centre, Dorking, Surrey.

A recent visit by the Editor to the Department of Entomology at the British Museum (Natural History) happened to coincide with that of a Treasury Official—who was being shown the collections and something of the work done by the Staff. Now the Treasury attempts to control public money as does the entomologist insects, and, whilst the Museum entomologist is no doubt only too well aware that he exists by virtue of the Treasury, one wonders whether the Treasury appreciates that its own, as well as the wealth and prosperity of the country in general, is to a considerable extent dependent upon entomologists?

The staggering rate of increase in world population means a greater demand for food and raw materials. These must be protected from insects at all stages of growth or production and during storage. To do this effectively we must know friend from foe, and here the Museum plays its valuable part in the accurate determination of insects submitted for identification.

Let the Treasury not underestimate the value in its own Treasury Notes of an accurate determination, for without it control of insect pests would be a hazardous and costly affair. The value of the accurate identification of insect vectors of disease is self-obvious.

The activities of the Museum in the latter sphere save lives—but the money saved the country and Commonwealth in the control of pests alone makes it probable that in reality (if it were possible to make a tally) the British Museum pays for itself many times over in each year.

In any case the collections are scientifically priceless, representing the insect fauna of every country in the World, and a centre of interest for students everywhere.

Let us hope that the Treasury's visit will lead to a more realistic approach to the pressing need for better equipment and more staff so that the British Museum (Nat. Hist.) can maintain its position among the great Museums of the World.

EXPERIMENTS WITH A REMARKABLE MELANIC STRAIN OF *ARCTIA CAJA* (L.)

By DAVID WRIGHT AND S. GORDON SMITH

OBSERVATIONS, *By* DAVID WRIGHT

Late in July 1954 I took from my mercury vapour trap an *Arctia caja (L.)* female approaching ab. *schultzii* Frings, the outer margin of the forewings having very reduced markings.

It was not a very startling aberration and the colouring was quite normal, but having just released the last of the 13th inbred generation of another *caja* strain which, after the 3rd gen. had failed to produce anything of interest, I decided to try to found a strain of the ab. *schultzii* form and to utilise the experience gained in rearing the 13 generations of the other strain in 24 months.

A brief description of the breeding technique may be of interest. The larvae hatched in small circular transparent plastic boxes, each with a floor covering of blotting paper to absorb condensation, which is considerable when cabbage is the foodplant in airtight conditions. After trying nettle, dead nettle, groundsel and various other foods, cabbage was found to be the most successful. Apart from the fact that *caja* takes readily to it, it is the one foodplant always available in quantity. Only the outer leaves should be given, and they have an advantage over most other foodplants in that the uneaten parts remain fresh for two days and need not always be thrown away when the cages are cleaned. When the larvae were about half-grown they were transferred to the circular celluloid-sided Watkins & Doncaster breeding cages, which comfortably hold 20-25 full-grown *caja* larvae. Blotting, or newspaper, floors were again used and changed every day. The necessity for this daily changing of the floor covering is shown by the fact that on analysis of the dried frass, Gordon Smith found it to contain as much as 2.98% of ammonia, and it is thought that the presence of this ammonia may account for some of the larval deaths we encountered.

For pupation I used Gordon Smith's excellent idea of using halved sections of egg packing, with waxed paper stuck on both sides. These structures stand upright in the cages and serve as useful supports for the cabbage leaves. The larvae find ideal cocooning sites in the cavities formed by the egg packing and only very rarely choose elsewhere in the cages, though when they do it is usually inconveniently in the angle between the side and the lid. To prevent the side and the lid getting stuck together in this way, I use a false lid of paper beneath the proper one. A fortnight after the last cocoon is completed the egg packing is taken out and, after the wax paper is removed, is placed in a pupa cage, so that the moths can emerge easily.

The whole cycle, from pairing to emergence, takes place in an airing cupboard through which hot water pipes pass, at a steady temperature of 70-75 degrees Fahrenheit.

I believe this temperature to be critical: if it is allowed to fall below 70 degrees, many larvae will stop eating and, if of appropriate size, begin looking for hibernating sites. If it gets up to 80 degrees, condensation in the cages becomes excessive.

In all the 13 generations mentioned above and in the seven to be described there must have been several thousand larvae, but I have had not a single death that could be attributed to a virus and I firmly believe that temperature is the governing factor in keeping them alive, feeding and healthy. Gordon Smith has had precisely the same experience.

The following is a description of the generations bred from the form approaching ab. *schultzii* taken in July 1954.

F.1.

Emerged Oct-Nov., 1954. Approximately 50, all typical in colour and pattern, except for the last five to emerge. These had typical markings on all wings and typical colouring on the forewings, but the ground colour of the hindwings and abdomen is best described as a smoky brown-pink. Presumably a not very extreme form of ab. *brunnescens* Stättermayer. A pairing was obtained between individuals of this form.

F.2.

Among the larvae were 17 all black individuals, this colouring appearing only in the final instar. They had none of the normally 'ginger' hairs, but had the usual white spots.

Emergence began in late Dec., 1954, and consisted of 11 typical, 24 ab. *brunnescens* and 17 ab. *nigrata,* a form described later in this article and which can fairly be called a 'black tiger'. This coincidence of 17 all black larvae and 17 ab. *nigrata* was noteworthy. The ab. *brunnescens* in this generation were far more varied and generally darker and richer in colour than those of the F.1. Pairings ab. *nigrata* x ab. *nigrata* were obtained.

F.3.

All the larvae were all black. Emergence began in March, 1955, and consisted of 95 ab. *nigrata,* one having lighter forewing ground-colour. Pairing obtained.

F.4.

All larvae all black. Emergence began in May. From approximately 150 pupae 100 imagines, all ab. *nigrata,* emerged. Many were wasted in unsuccessful attempts to get pairings and finally, to save the strain from dying out, I paired one with a wild typical male—almost the first seen in the summer—producing:

F.1 (i.e. offspring of wild typical male x 4th inbred gen. ab. *nigrata*).

All larvae were of intermediate colouring, the normally 'ginger' hairs being a medium-dark brown. Emergence began in August. Approximately 150, all ab. *brunnescens*. Gordon Smith had similar results from the pairing of a wild Chester male with an ab. *nigrata*. Pairings obtained.

F.2.

About 15 per cent. of the larvae were all black, the rest shading from typical into brown. Of the 420 imagines to emerge, 44 were reared by Robin Mere and 376 by me.

Robin Mere's figures for the F.2 gen. were: Type 9: ab. *brunnescens* 23: ab. *nigrata* 12. They were bred from a random batch of eggs I gave him from which about 100 larvae hatched. My own larval losses were very few, and had all the larvae that died been ab. *brunnescens* and ab. *nigrata* in a proportion to choice, the ratio would still have been far from the theoretical 1 : 2 : 1, which was sufficiently closely approached in the Dec., 1954, F.2 gen. Our combined figures were, Type 197: ab. *brunnescens* 156: ab. *nigrata* 67, a considerable departure from the expected ratio. Pairings were obtained, ab. *nigrata* x ab. *brunnescens* by Robin Mere and ab. *brunnescens* x ab. *brunnescens* by me, and at the moment of writing, mid-December, 1955, the larvae are beginning to spin up.

A few individuals with ab. *schultzii* markings occurred in all but the Oct., 1954, F.1 gen., and in all the colour forms, i.e. typical, ab. *brunnescens* and ab. *nigrata*, but were very scarce in the Oct., 1955, F.2 gen. Gordon Smith, however, produced many fine examples of this form from a pairing of 4th gen. ab. *nigrata* x wild Chester male, and these are dealt with in his section of this article.

It now seems to be established beyond doubt that all-black *caja* larvae produce melanic imagines, such as abs. *achlyoessa, nigrata, wrighti, paurobalia, fusca,* described by Gordon Smith, that those in which the 'ginger' hairs are replaced by brown produce ab. *brunnescens* and that the typically coloured larvae produce typically coloured *caja,* and it would appear a simple matter to separate the black, brown and typical larva with the certainty that they would produce melanics, ab. *brunnescens* and the type respectively, but it is not so easy as that. The black larvae certainly are separable and can always be set aside in the sure knowledge that they will produce melanic moths, as can the darker brown and the true 'ginger', which will produce ab. *brunnescens* and the type respectively, but whereas there is a sharp and unmistakable difference between the darkest brown larvae and the black, there is no such clear-cut division between the lighter brown and the darker 'ginger'. The 'ginger' forms grade imperceptibly into the brown, and it becomes a matter of opinion as to which is a dark 'ginger' and which a light brown, but at the other end of the scale the browns do not merge into the black—there is a distinct break between them.

Much the same thing occurs in the colouring of the moths, but here I must say that in my opinion the feature that should be taken as the constantly distinguishing one between the aberrations *brunnescens* and the melanic forms is the ground colour of the hindwings. I think the pattern of the forewings and the shape and size of the spots on the hindwings can be left out of account, because they vary in the same way in the type, ab. *brunnescens* and the melanics, no matter what the ground colour of the wings may be. Likewise the ground colour of the forewings, which runs in a steady gradation from the normal cream-white in the type and some ab. *brunnescens* through the whole range of ab. *brunnescens* and down to the smoky brown of the melanics without a break.

These facts become very apparent when, as in the Oct., 1955, F.2 generation, a large number are reared and set and comparisons can be made. From this generation alone I set 146 specimens, and it is extremely interesting to see how the hindwing colouring shades imperceptibly from the typical brilliant red into a dusty pink and through various shades of grey-pink and brown-pink down to a dull brown, and then the abrupt change from these colours, all of which have some warmth in them, to the fuscous and fuscous black hindwings of the melanics, quite devoid of any suggestion of red.

I have bred a few very dark ab. *brunnescens* and some less dark melanics, and it might be thought difficult to separate the two under their correct names, as indeed it would be, were it not for this constant feature of the hindwing colouring. Even the darkest ab. *brunnescens* has a trace of red, pink or brown on the hindwings, while the least dark of the melanics has no trace of these colours.

From the foregoing it will be seen that our melanics bear a resemblance to the melanic figured by Cockayne, *Proc. S. Lond. ent. nat. Hist. Soc.*, 1947-48 (Pl. V, Fig. 8) as ab. *fumosa* Hörhammer, but the original description of the latter states that the hindwings are overlaid with deep red-brown, and for this reason we do not feel justified in accepting the melanic aberration discussed here as ab. *fumosa*. Also, it has in every case developed from an all-black larva and we are not aware that this was the case with the ab. *fumosa* described by Hörhammer.

Observations, Descriptions of Ten New Aberrations, and Appendix

By S. Gordon Smith

Of his F.3. generation of the melanic larvae, David Wright sent me 20 which produced 7 melanic male and 6 melanic female moths; the males have normal markings but the females exhibited markings of the following aberrations:

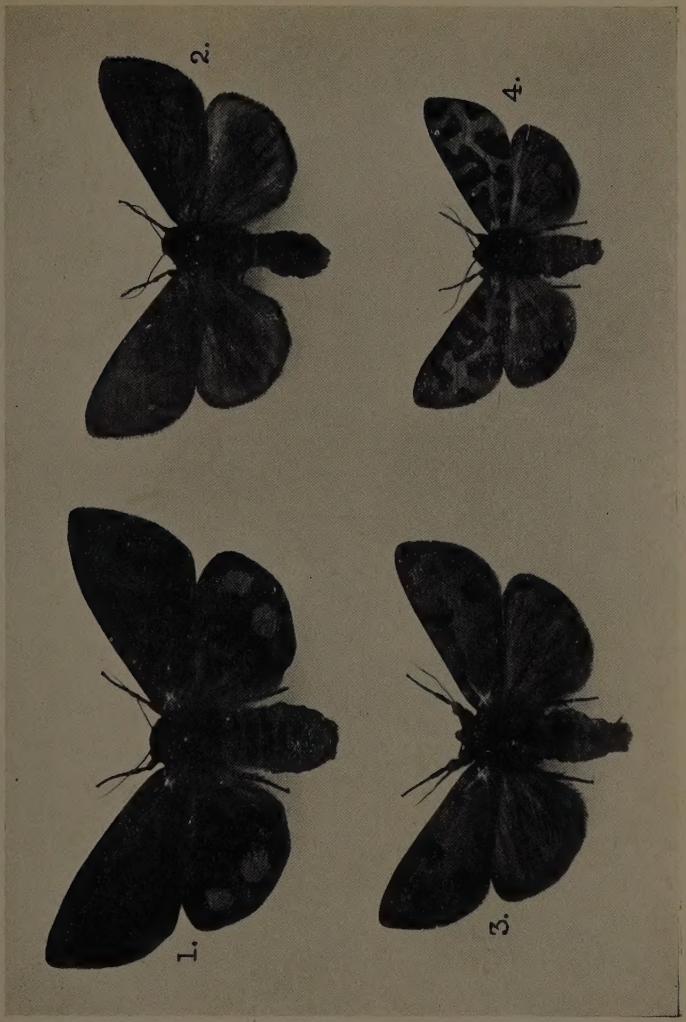


Photo by W. E. Ashworth

ABERRATIONS OF *ARCTIA CAJA* (L.).

1. Ab. *nigrata* Gordon Smith.
2. Ab. *wrighti* Gordon Smith.
3. Ab. *paurobalia* Gordon Smith.
4. Ab. *fusca* Gordon Smith.

One ab. *divisa* Cockayne
One ab. *conjuncta* Stättermayer
One ab. *confluens* Rebel
ab. *basicincta* Cockayne
ab. *fusata* Gordon Smith
One which I have described as ab. *achlyoessa.*

The rest of the specimens were normal as regards markings. As I was unable to obtain any pairings from this batch, David Wright sent me 40 more melanic larvae of the F.4. generation; they produced 19 melanic males and 10 melanic females; these were also very variable and contained markings of the following aberrations—all melanic forms:

Four ab. *fusata* Gordon Smith	Males
One *mediodeleta* Cockayne	Male
One *basicincta* Cockayne	Female
One *juncta* Biezanko	Female
One *consolidata* Cockayne	Male
Two *wrighti* Gordon Smith	Females
Two *divisa* Cockayne	Females

The rest of the specimens were normal as regards markings.

As I had been unable to obtain any pairings between males and females of this F.4 generation and at the time had several males of a Norfolk typical strain, I managed to get two pairings with two of the above melanic F.4. females; both these females were of the normal pattern as regards markings.

Over 500 moths were reared from these two pairings with interesting results. I think they may be designated as ab. *brunnescens* Stättermayer. As regards the colour, which was very variable, none was of the melanic form of the female parent, some had the ground colour of the forewings almost white, others were smoky; the ground colour of the hindwings also varied considerably from almost normal to brown; as regards the markings, all the above aberrations appeared, the form with the outer margin of the forewings without markings except for a small mark at the apex, being particularly interesting because it was almost ab. *schultzii* Frings.

So, in order to try to get rid of the odd markings on the outer margin and obtain a whiter ground colour, I paired similar females with typical Cheshire males and the result gives females with white ground colour with the usual markings, except that the terminal band is represented solely by an apical spot.

Being interested in obtaining as many different aberrations as possible and feeling that it was impossible to obtain accurate information for the purpose of ratios as regards genetics owing to the delicate constitutions of many of the melanic larvae and the higher percentage of losses incurred, it being impossible to separate melanic larvae before the final instar, I decided to rear portions of as many broods as possible with the object of securing aberrations.

The results of several of the pairings are as follows:

Nos. NF1 and NF2.

Parents of F.1 generations two Norfolk typical males x with two ab. *nigrata* females.

Aberrations reared, ab. *brunnescens*. (See appendix.)

No. 1 and 2.K.

Parents of F.2 generation, male ab. *brunnescens* with reddish hindwings x with female ab. *brunnescens* with smoky forewings and brown ground colour hindwings.

Aberrations reared: *brunnescens, achlyoessa, fusca, nigrata, sordida.*

No. 1 and 2.K.A.

Parents of F.3. generation, male ab. *nigrata* x female ab. *sordida.*

Aberrations reared: *achlyoessa, nigrata, sordida, fusata, brunnescens.*

No. 1 and 2.K.B.

Parents of F.3. generation, male and female ab. *sordida.*

Aberrations reared: *sordida, divisa, brunnescens, achlyoessa, nigrata.*

No. 2.L.

Parents of F.2 generation, male ab. *brunnescens* with reddish hindwings x with female ab. *brunnescens* with reddish hindwings with ab. *confluens* and ab. *fusata* markings.

Aberrations reared: *confluens, fusca, brunnescens.*

No. 2.L.B.

Parents of F.3. generation, male ab. *brunnescens* with banded forewings, smoky red hindwings x female ab. *brunnescens* with reddish hindwings and ab. *confluens* and ab. *fusata* markings.

Aberrations reared: *nigrata, confluens, lunulata, paurobalia.*

No. 12.

Parents of F.1 generation, male wild Chester, typical except for the spots of the hindwing which are smaller than normal x female ab. *brunnescens* with reddish hindwings, forewings with a tendency towards ab. *schultzii.*

Aberrations reared: *brunnescens, schultzii.*

Two pairings obtained, Nos. 12A. and 12B.

No. 12A.

Parents of F.2 generation, male ab. *brunnescens* with white ground colour forewings, brownish hindwings x female ab. *schultzii.*

Aberrations: *schultzii, brunnescens, flavosignata* Closs, *poveyi, divisa.*

No. 12B.

Parents of F.2 generation, male typical in appearance, female ab. *schultzii* with smoky hindwings.

Aberrations reared: *mueckl* Kramlinger, *flavosignata, schultzii, poveyi, brunnescens, septata* Gordon Smith and a beautiful asymmetrical specimen Plate VI, Fig. 1.

Photo by W. E. Ashworth

ABERRATIONS OF *ARCTIA CAJA* (L.).

1. Ab. *achlyoessa* Gordon Smith.
2. Ab. *abdominalis* Gordon Smith.
3. Ab. *sordida* Gordon Smith.
4. Ab. *schultzii* Frings.

Ent. Gaz., Vol. 7, No. 3. To face page 124

No. 11.

Parents of F.1. generation, male wild Chester ab. *divisa* x female ab. *brunnescens*, normal forewings, hindwings brown.

Aberrations reared: *divisa, brunnescens* almost all with *divisa* markings.

Two pairings obtained, Nos. 11A. and 11B.

No. 11A.

Parents of F.2 generation, male ab. *divisa* (normal colour) x female ab. *divisa* with smoky hindwings.

Aberrations reared: *divisa* in many variations of colour similar to ab. *brunnescens*.

No. 11B.

Parents of F.2 generation, male ab. *divisa* x female ab. *divisa*.

Aberrations reared: *rubra*, combined with *discojuncta* Cockayne and *confluens*, brownish *brunnescens* with *divisa* markings.

No. 21.

Parents of F.1. generation, male wild Chester typical x female ab. *brunnescens* making No. 10 x female ab. *brunnescens* with brown hindwings x male No. 10.

Aberrations reared: *rufa, nigrata, brunnescens, divisa*.

No. 29.

Parents of F.1. generation, male *brunnescens* from No. 12 pairing x with female approaching ab. *abdominalis* from a pairing between a Norfolk typical male and an ab. *brunnescens*.

Aberrations reared: *abdominalis, nigrata*.

Appendix

In the *Proc. S. Lond. ent. nat. Hist. Soc.*, 1947/48, page 161, the description of ab. *brunnescens* Stättermayer in *Ent. Anzeiger*, 1924, **4**: 70 is 'Hindwings overlaid with smoky-brown'.

According to an authority on genetics, the two pairings Nos. N.F.1 and N.F.2 between Norfolk typical males and ab. *nigrata* females should give 100% ab. *brunnescens*.

I feel it necessary to state that in the F.1. generations from these pairings are some moths difficult to distinguish from typical *caja*; the hindwings are not overlaid with smoky-brown, there is only the slightest trace of this colour on some of them. If similar specimens had been captured in the wild state they would probably have been classified as normal.

Nevertheless pairings with this form have produced melanic moths similar to those from pairings of ab. *brunnescens* answering Stättermayer's description.

It is possible the ab. *flavosignata* of the F.2. generation of No. 12 pairing are of Chester origin, because in 1952 two females of this rare aberration were reared from ova deposited by a Chester female. It was not possible to rear any more from the 1952 strain as all the larvae died.

NEW ABERRATIONS OF *ARCTIA CAJA* (L.)

By S. GORDON SMITH

Arctia caja ab. **achlyoessa** ab. nov.

Forewing ground colour warm fuscous, the dark pattern sepia, darker-edged, the terminal band represented only by an apical spot and a trace at the middle of the termen; hindwing fuscous black, the black-edged bluish spots dull but prominent; thorax sepia, abdomen fuscous with a trace of dull reddish, the dorsal bars similar in appearance to the hindwing spots.

The pattern of the forewing resembles that of ab. *schultzii* Stättermayer, with the ground fuscous instead of white.

Type: Female, F.3 generation, bred Hants. 1955 from melanic larva.

Plate V, Fig. 1. S. Gordon Smith coll.

Arctia caja ab. **lutulenta** ab. nov.

Forewing almost completely cold sepia, the white pattern restricted, as seen in Plate VI, Fig. 5, from the base along the costa, none reaching the inner margin or termen; the lighter patch terminad seems to be due to the loss of scales; hindwing black, fuscous at base and inner margin, fringe fuscous black with a fine white edge, a faint trace of the bluish sheen subterminally; four small spots of pinkish buff across the middle of the wing; thorax and abdomen warm sepia with a slight reddish tinge at their junction, affecting also the base and inner margin of the hindwing.

Type: Male, F.1. generation, Chester male x (Hants. x Norfolk) female, 1955.

Plate VI, Fig. 5. S. Gordon Smith coll.

Arctia caja ab. **nigrata** ab. nov.

Forewing ground colour warm fuscous, the dark pattern normal in shape, rich sepia, darker-edged; hindwing fuscous black, the black-edged bluish spots normal; thorax rich sepia, abdomen fuscous with the dorsal bars fuscous black, antenna sepia, legs blackish brown.

There is no trace of red or pink on this specimen.

Type: Female, bred F.3 generation from melanic larva, Norfolk x Hants. 1955.

Plate IV, Fig. 1. S. Gordon Smith coll.

Arctia caja ab. **sordida** ab. nov.

Forewing with the light ground colour degraded by a suffusion of fuscous which has almost eradicated the white ground colour; dark markings rich sepia, the terminal band represented only by an apical spot and a trace at the middle of the termen; hindwing dull ochre red degraded in varying degrees by fuscous; abdomen ochre red to rufous, dorsal bars black like the prominent hindwing spots with hardly a trace of bluish sheen.

Type: Female, bred F.3 generation. Norfolk x Hants. 1955.

Photo by W. E. Ashworth

ABERRATIONS OF *ARCTIA CAJA* (L.).

1. An asymmetrical specimen bred from No. 12B. pairing.
2. Ab. *rufa* Gordon Smith.
3. Ab. *lunulata* Gordon Smith.
4. Ab. *poveyi* Gordon Smith (type).
5. Ab. *lutulenta* Gordon Smith.
6. Ab. *poveyi* Gordon Smith.

Plate V, Fig. 3. S. Gordon Smith coll.

Arctia caja ab. **paurobalia** ab. nov.

Forewing rich fuscous with the scarce markings dark sepia; hindwing fuscous black, the spots black with the blue sheen spreading over the wing surface. Thorax rich sepia. Abdomen fuscous with black bars and a slight trace of the reddish tinge in the hair scales at the base.

Type: Male, bred F.3 generation from melanic larva, Norfolk x Hants. 1955.

Plate IV, Fig. 3. S. Gordon Smith coll.

Arctia caja ab. **abdominalis** ab. nov.

Forewing with ground colour white degraded with fuscous, the dark markings bone brown; hindwing fuscous black with a suspicion of an ochre red tinge from the base to the two largest spots; spots prominent, black (without blue sheen) thorax bone brown; abdomen ochre red with black dorsal bars.

Type: Female, bred F.1 generation, Chester x (Norfolk x Hants.) 1955.

Plate V, Fig. 2. Gordon Smith coll.

Arctia caja ab. **lunulata** ab. nov.

Forewing ground colour white degraded patchily with fuscous; dark markings dark sepia; hindwing fuscous with a suspicion of ochre red, the basal and discal spots joined, the subterminal spots heavy, joined along the termen, with a series of preterminal lunules from wing apex to anal angle. Light markings on underside light buff, dark markings sepia. Thorax sepia, pectus and legs sepia with some ochre red, abdomen ochre red, the dorsal bars black.

Type: Male, bred F.3 generation, Norfolk x Hants. 1955.

Plate VI, Fig. 3. Gordon Smith coll.

Arctia caja ab. **rufa** ab. nov.

Forewing with ground colour cartridge buff, with rich bone brown dark markings. Hindwing and abdomen brazil red slightly degraded over basal half with fuscous; spots on hindwing and dorsal bars on abdomen normal. Underside of hindwing light buff to ochraceous buff with a tinge of rufous, slightly degraded with fuscous along inner margin.

Type: Female, bred F.1 generation, Chester x (Norfolk x Hants.) 1955.

Plate VI, Fig. 2. S. Gordon Smith coll.

Arctia caja ab. **fusca** ab. nov.

Forewing ground colour bister, the dark markings sepia, slightly darker-edged; hindwing fuscous, spots normal; thorax rich sepia, abdomen fuscous with blackish brown dorsal bars, antennae drab, legs sepia. There is no trace of red or pink on this specimen.

Type: Male, bred from melanic larva, F.2 generation, Norfolk x Hants. 1955.

Plate IV, Fig. 4. S. Gordon Smith coll.

Arctia caja ab. **poveyi** ab. nov.

Forewing ground colour cartridge buff, dark markings rich sepia; hindwing less bright than in normal *caja.*

Forewing short and with the apex rounded and termen deeply bowed; hindwing also short with a deeply bowed termen.

Type: Male, bred F.2 generation, Chester x (Norfolk x Hants.) 1955.

Plate VI, Fig. 4. S. Gordon Smith coll.

ACKNOWLEDGMENT

We are very grateful to Mr. W. H. T. Tams for his advice in compiling this paper and assistance in describing the aberrations.

BOOK REVIEW

Going Wild by Colin Wyatt, Hollis & Carter, London, 1955. Price 21s.

This book was sent to me to review during the Christmas vacation. As vacation reading, it was most suitable, light, witty and interesting. Although the author claims to be an entomologist, he appears to confine his interest to Butterflies. Nevertheless, all entomologists will enjoy his reminiscences of good captures made in places as far apart as Norway and New Zealand. Mr. Wyatt's interest in natural history has a wide range and he writes about mammals, birds and plants with equal facility.

An excellent series of the author's own photographs illustrate the book and some of them brought back many happy memories to the reviewer. A couple of plates have been made from the author's own water colours but, as they are in black and white, they have lost much of their charm; they do confirm the impression gained from the photographs that the author is an excellent artist.

Mr. Wyatt is also an authority on ski-ing and few interested in this sport can have had the opportunities of trying so many locations. He has skied even in the Atlas Mountains.

Few will be able to pick up this book without wanting to read it right through and it would make an excellent present. Those of us living on fixed salaries will, no doubt, envy Mr. Wyatt, who apparently, at the drop of the hat, can decide to go "off to Philadelphia in the morning" as the song has it. He is a true cosmopolite and can readily command attention. At a guinea, the book is not unduly expensive these days, but most of us will probably have to be content with borrowing a library copy.

FERGUS J. O'ROURKE.

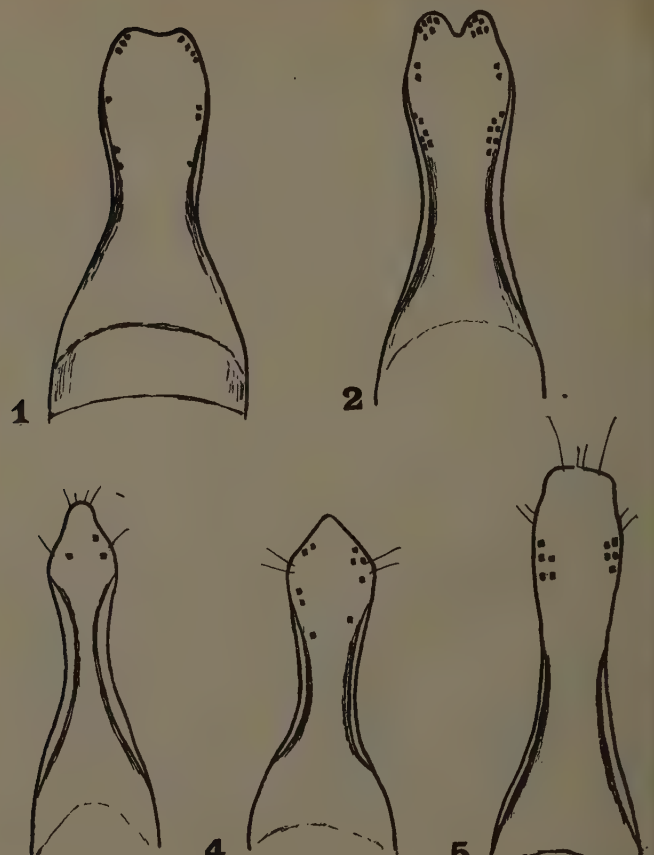
QUEDIUS (*MICROSAURUS*) *OCHRIPENNIS* (MENETRIES) AND *Q. ASSECLA* MULSANT & REY

By H. R. LAST, F.R.E.S.

For some considerable time it has been recognized that specimens of *Quedius ochripennis* (Ménétriés) in British Collections were not in fact that species. Some few months ago I submitted specimens identified as this species to Dr. Gridelli, of Trieste, who returned them as *Q. assecla* Muls., & Rey. This species bears a great resemblance to *ochripennis,* but the shape of the paramere of the aedeagus will at once separate them. In both species this varies somewhat both in shape and in the arrangement of the 'pegs' on the 'inner face', but allowing for this variation the parameres are quite distinct as to leave no doubt as to identity. The paramere of *assecla* is similar to that of *Q. invreae* Gridelli, but the apical identation and to a lesser extent the arrangement of the 'pegs' on the 'inner face' are useful guides to identification. Gridelli also mentions the different placing of the eight bristles, but these are often broken off. It must be mentioned that it is not absolutely certain that *assecla* sensu Muls., & Rey is identical with *assecla* sensu Gridelli, but in his article Dr. Gridelli (*Mem. Soc. Ent. Ital.* 1924, **3**: 48) states that the three males upon which he based his observations could with a certain probability be ascribed to *assecla* Muls., & Rey (from Provence and Lyons), and the original description corresponds to the three Italian specimens from Murata (Liguria), Belvedere (Genova) and Rome. In his later work Dr. Gridelli (*Mem. Soc. Ent. Ital.*, 1929, **8**: 27-33) gives drawings of the aedeagus of the three species mentioned. The Rev. C. E. Tottenham informs me (in lit.) that all the British *ochripennis* he has seen have been *assecla,* and it does appear that, so far, the true *ochripennis* has not yet been recorded from Gt. Britain. Dr. Gridelli writes that this seems quite incredible, as it is very widely spread throughout Middle Europe, and predicts that we are sure to take it before long.

Mr. Philip Harwood has kindly supplied me with data from his collection of *assecla,* and these include several localities in Inverness-shire, Crichel and Wimborne, Dorset; Bishops Stortford, Essex; Goodwood, Sussex; and Darenth Wood, Kent.

By kind permission of Mr. A. E. Gardner, Curator of the collections of The South London Entomological and Natural History Society, I was able to examine specimens in the Joy collection over the names of *ochripennis,* and find they are *assecla* from Bradfield, Yorks.; Aldworth, Berkshire; Shiplake, Oxfordshire. In the Power Collection (Brit. Mus. Nat. Hist.) there are specimens from Brad-



Figs. 1-5. Inner face of paramere of (1) *Q. assecla* Muls., & Rey. (2) *Q. brevicornis* (Thomson). (3) *Q. ochripennis* (Ménétriés). (4) *Q. othiniensis* Johansen. (5) *Q. assimilis* (Nordmann).

field, Yorks; Weybridge and Mickleham, Surrey; Birdbrook, Essex. I have taken it at East Runton, Norfolk.

The following species bear a certain similarity in general appearance, and I have therefore made camera lucida drawings of the paramere in each case to facilitate identification of the males *othi-*

niensis Johansen, *ochripennis* (Ménétriés), *brevicornis* (Thomson), *assimilis* (Nordmann), *assecla* (Mulsant & Rey).

I also record my indebtedness to Dr. Gridelli and Rev. C. E. Tottenham for valuable help, and to Mr. E. B. Britton for the opportunity of examining the specimens in the British Museum (Nat. Hist.) Power Collection, and to Mr. J. Wiser for his translation from the Italian.

12 Winkworth Road,
Banstead, Surrey.

PHILONTHUS PACHYCEPHALUS NORDMANN, VAR. *COLORIPENNIS* BERNHAUR, IN BRITAIN (COL: STAPHYLINIDAE)

Whilst identifying a number of specimens of Staphylinidae for Mr. A. Smith, of Heworth, Yorks, I came across a specimen of *P. pachycephalus* which had the greater part of the elytra reddish-yellow. The Rev. C. E. Tottenham informs me that this is var. *coloripennis* of Bernhauer, who named and described it from a specimen taken at Ala-Tua in the Middle East (*Ent. Blatter,* 1910, **6**: 257). The Rev. C. E. Tottenham has two specimens in his collection, one from North Ussurisk, Siberia; and a British specimen taken by himself at Skipwith, Yorks, 29.6.1937. He informs me that from his long experience of the genus this is quite a rare form of this common species. This specimen, a male, was taken at Shirley, Surrey, 24.9.1936, by Mr. W. J. Watts, and by the kindness of Mr. Smith is now in my collection.

H. R. LAST, F.R.E.S.

12 Winkworth Road,
Banstead, Surrey.

NEOBLATTELLA CARCINUS REHN & HEBARD, IN MIDDLESEX (DICTYOPTERA : BLATTIDAE)

A perfect specimen of this cockroach was taken by Mr. E. W. Classey in a fruiterer's shop at Feltham, Middlesex, on 15th September, 1955. Bunting (1955, *Ent. mon. Mag.,* **91** : 134) records *Neoblattella* sp., and many other species from a wholesale fruiterers at Thorne, Yorkshire, these imported in bananas from Dominica.

A. E. GARDNER.

29 Glenfield Rd.,
Banstead, Surrey.

BOOK REVIEWS

Die Neue Brehm-Bücherei:

Heft 89: *Blasenfüsse,* by Prof. H. von Oettingen, Leipzig, 1952; 40 pp., 18 figs., price ..... 3s. 0d.

Heft 91: *Blattminen,* by Prof. Dr. Erich M. Hering, Leipzig, 1953; 70 pp., 43 figs., price ..... 4s. 6d.

Heft 98: *Flöhe,* by Prof. Dr. F. Peus, Leipzig, 1953; 43 pp., 31 figs., price ..... 3s. 0d.

Heft 110: *Staubläuse,* by Dr. Stefan v. Kéler, Leipzig, 1953; 48 pp., 20 figs., price ..... 3s. 0d.

Heft 138: *Aus dem Spinnenleben wärmerer Länder,* by Dr. Hermann Wiehle, Lutherstadt, 1954; 88 pp., 71 figs., price ..... 7s. 6d.

Heft 149: *Blattläuse,* by Dr. Fritz P. Müller, Lutherstadt, 1955; 144 pp., 60 figs., 2 keys, price ..... 12s. 0d.

Heft 160: *Tiere an Pappel,* by Prof. Dr. Hellmuth Gäbler, Lutherstadt, 1955, 42 pp., 38 figs., price ... 3s. 6d.

This excellent series provides those interested in Natural History with fairly cheap booklets written by specialists. The standards of scientific accuracy set by the seven parts which are under review is high, and although the manner in which the individual authors have treated their subjects may be criticised, there cannot be any doubt about the authority with which they write. I therefore wholeheartedly recommend the series to those readers who can read German. The quality of the paper varies from part to part, but is always at least fair. All parts have paper covers and measure 15 x 21 cm. In all the parts under review a bibliography of the major works on the subject in question is provided for those who desire more detailed information, the only real defect being the absence of indexes.

Prof. von Oettingen's account of the Thysanoptera is clear and concise. Having given a good account of their morphology and biology, he then systematically treats the various families, giving detailed accounts of species of economic importance (especially *Aeolothrips intermedius* Bagn., *Aptinothrips* spp. and *Thrips tabaci* Lind.). There are also short chapters on Control and Collecting.

Prof. Hering gives an account of the biology of leaf-mining insects. The scope of his book is similar to that of his major work, 'Biology of the Leaf-miners' (1951). The specialist will find nothing additional contained in this smaller work, apart from the brief introductory chapter on 'Blattminen im Volksglauben und in der Wissenschaft'. But it can be recommended to anyone who cannot afford the larger work. The author deals with the biological aspect of leaf-mining and the effects on plant tissue. There is no systematic account of the various types of insects that produce mines, except in the most general terms. The book is to this extent unbalanced: but in spite

of this general criticism it shows the usual high standard that we have come to expect from its author.

Prof. Peus' book deals with the development, adaption and ecology of fleas, and will prove as useful to anyone concerned with the eradication of these pests as to the naturalist whose interest is purely objective. It also contains short chapters on control, disease-spreading and geological age. The emphasis, as in most works in this series, is on biology and ecology, not taxonomy.

Dr. von Kéler's book on Booklice (Psocoptera or Copeognatha) maintains the high quality of the series, but lends itself to some minor criticisms. The author deals first with the climatic toleration and development of the order. His next three chapters are then entitled 'Die Ortswechsel und die Ortswechselorgane der Copeognathen', 'Die „Meisselkiefler"' and 'Die „Totenuhr"', in the last of which he describes stridulatory organs. These chapters are very interesting as they stand, but why are they not incorporated into a complete account of the morphology? The book ends with a chapter on damage (or rather lack of it!), and a check-list of the German species of the order, amounting to 76 in all. The author must also be criticised on one point of detail with reference to pages 27 and 30. Here he belittles the term 'Protective Coloration' (Schutzfärbung). This affords me the opportunity of restating a principle with regard to Evolution that is rarely understood, i.e., that *any effect however infinitesimal is of significance in Evolution.* I will state this in mathematical terms: the percentage difference in the survival rate that any character must produce in its possessors in order to dominate a population of constant average size *P*, *n* generations after the original mutation which produced that character, is equal to $100\ (P^{1}/n—1)$. It can easily be seen that with even moderate values for *n*, the expression rapidly becomes infinitesimal. But Evolution is a process which involves thousands and millions of years (it has been estimated that the formation of a species requires 10 million years). It is therefore ridiculous to deny protective coloration on the grounds that no protective effects can be observed. If the protective effect were so large as to be easily observable, then the victory of the genes which produce it would be complete in accordance with the above formula with very small values of *n*. Examples of such an occurrence must perforce be few at any given time, because they are so transient. However, to return to Dr. v. Kéler's book, the above criticism in spite of its length is minor. For most practical purposes the effect of protective coloration in the Psocoptera (or Copeognatha) is negligible. But nevertheless the effect *does* exist.

Dr. Wiehle's book on tropical spiders deals with the habits and peculiarities of the more unusual members of this group. The titles of the chapters speak for themselves: Bird-spiders, Silk-spiders (Nephila), 'Stabilimente' (supernumerary threads in webs), Parasitic

Spiders, Armoured Spiders, Social Spiders, Ant-spiders, Strange Capture-methods and Tropical Micro-spiders. The author makes no attempt at giving any idea of the classification of the group. His concern is purely with behaviour and adaption. Given this limitation, the work is very interesting and informative. The author is critical of his sources; he is especially preoccupied with impressing upon readers the great importance that the attacks of Pompilid wasps have with regard to Spider behaviour, and with belittling the danger to the males from the females. These opinions he justifies quite well.

Dr. Müller's work on plant-lice (Aphididae *sensu lato*) is a model of its kind. The author outlines the classification of the group into families, giving a clear account of the characters used. Then he considers biology and development. The major part of the book then consists of accounts of the Aphids which attack trees and plants which are commonly cultivated. Included are keys to the species which normally occur in greenhouses, and those which attack roses. There are also chapters on virus-spreading and chemical control. For the gardener and forester this book is ideal, supplying a definite need.

The insects living on Poplar are treated by Prof. Gäbler. His book would prove useful to anyone concerned with the cultivation of poplars, as well as to the naturalist. It could well be used in conjunction with the Forestry Commission's bulletin on Poplars. The main drawback is that it is too compressed. The result is that the descriptions given for many insects are barely adequate for determination. This is especially noticeable in his treatment of the Aphids. The numerous gall-producing species are only given a few lines apiece, and the open-feeding species are totally ignored. A key is really needed for this group. One also regrets the absence of any reference to the four Phytagromyza spp. (Dipt. Agromyzidae) which mine the leaves of poplars. G. C. D. GRIFFITHS.

Felted Beech Coccus. Forestry Commission Leaflet No. 15, 1956. pp. 8, 7 figs. Price 6d.

This leaflet maintains the very high standard that we have come to associate with the publications of the Forestry Commission. In eight pages, there are seven figures, three of which are excellent reproductions of photographs. The systematic position of the felted beech coccus (*Cryptococcus fagi* Baer) is briefly considered. A description is given of the appearance of the lesions on the tree and of the adult and nymphal insects. The life history, association with the fungus *Nectria*, economic importance and natural and artificial control are in turn considered. It seems churlish to criticize Dr. Hussey's excellent leaflet, but I feel that the space occupied by either Fig. 1 or Fig. 4 could have been better used by a distribution map of the species in these islands, for the statement 'In Britain it has been recorded as far north as Inverness, while it is also known in Ireland' is less likely to stimulate interest in the distribution than would a map.

FERGUS J. O'ROURKE.

WEST COUNTRY REMINISCENCES

By G. E. L. MANLEY

Lying in bed during the last drab days of January and slowly recovering from 'flu, I let my mind wander and began to think of the possible expeditions to be made during the coming season. But have you ever realized the number of plans made during the winter that never come to fruition when the right time comes along? Then I began to think of past days both successful and unsuccessful, but all enjoyable, and particularly of trips to the West Country, and I wondered whether some notes might be of use to others going that way.

When my wife and I go on holiday we plan it with collecting in view, but not for the whole time consistently, for we like to enjoy new scenery and surroundings, to sit by the sea, to visit the local town, and even to test the standard of the local hostelry. It is perhaps therefore lucky that I am only interested now in the Noctuidae, and prefer hunting for larvae to collecting moths, if the choice is available. We have an old pre-war Ford that is as faithful to us as any horse of bygone days, and into it we throw all our kit and, when necessity demands, even sleep the remainder of the night in it.

It was in this frame of mind that we first set off westwards in 1952. On July 25th we arrived at a friend's house on top of a cliff known as 'Burning Cliff', just east of Weymouth. Here, where the cliff-face has fallen away, we found a damp patch with bullrushes and yellow iris growing from which we collected pupae of *Nonagria typhae* Thunberg and *N. spargannii* Esper. We were unpleasantly surprised when two adders came out from under a boulder to sun themselves close to my wife. Light produced of interest only one *Cryphia muralis* Forster, one *Euxoa nigricans* Linnaeus and three *Triphaena interjecta* Hubner.

On 30th July we pushed on to Seaton to see if we could find *Silene nutans* with a view to locating *Hadena albimacula* Borkhausen. This we soon gave up owing to the overgrown state of the ground, and continued on to Exmouth. I badly wanted to find *Agrotis ripae* Hubner larvae, as I had been told that red forms were to be had from areas where the cliffs were also red. We walked along the top of the cliff to the east, down the steps to sea-level, and then still further east along the sands, but there was no sign of our quarry.

Next day, 31st July, we visited Dawlish, but lost heart at the sight of the swarming crowds, and then went on to call at Maidencombe on Mr. Frank H. Lees and his sister, who made two strangers so very welcome. We were shown a wonderful series of bred *Plusia ni* Hubner, and also *Celerio livornica* Esper in the act of emerging. After tea we visited Ansty's Cove but did not like the look of it

for collecting *Leucania putrescens* Hubner, so walked along the coast until we came to Hopes Nose and decided to give it a try that night. Dusk found us at the coast-guard hut at the end of this promontory and we had the satisfaction of taking fourteen *putrescens* flying to the valerian growing around it, though their condition would have been better a few days earlier. We also took one fresh male *Ammogrotis lucernea* Linnaeus, one *Hadena lepida* Esper and two larvae of *Pyrrhia umbra* Hufnagel. Well satisfied with the evening we drove inland, and at about 1.30 a.m. pulled the Ford to the side of the road short of Kingsbridge and settled down to sleep. At this point the heavens opened and torrential rain came down until after we had dozed off.

The 1st of August dawned with brilliant sunshine and we drove to Bantham still looking for *ripae* and hoping to find *Hadena andalusica* s.sp. *barrettii* Doubleday. From here I walked along the top of the cliffs (dropping down to sea-level when possible) to Yarmouth Sand and Thurlestone, where my wife met me with the car again. On the golf-course I saw a *Colias croceus* Geoffroy in Fourcroy ab. *pallida* Tutt, and having no net, somehow managed to throw my hat over it when it settled. Then, *mirabile dictu*, I successfully boxed it. It was at Thurlstone that I found the first *ripae*, but only very few.

We were to be based on a friend's house west of Plymouth and we arrived there in the evening. From here we paid visits both by day and at night to Whitsand Bay, attacking it both from Portwrinkle and Tregantle. We collected larvae both of *Hadena conspersa* and *lepida* on *Silene maritima*. The former larvae produced a small percentage of nice forms, while the latter produced moths of a deep chocolate-brown colour.

On 4th August we returned to the Thurlstone coast for the day and found one patch of sea bindweed with about 175 *ripae* larvae under it. A few moths partially red resulted, but not the all-red form that I was after. We also found some forty *Diataraxia oleracea* Linnaeus on *atriplex* and two very small *barrettii* larvae feeding in the stems of rock spurrey. These latter were the first we had seen, though we had been looking for them ever since we had arrived in the area.

The 5th of August saw us on our way to visit Polperro, where we had been told *barrettii* occurred. Sure enough, as soon as we reached the rocks on the west side of the Harbour, we started to find full-fed larvae under and in the roots of rock spurrey (but only one in *silene*). We got about thirty-five, much to the interest or mistrust of the other holiday-makers, and then set off to Talland, but found nothing except some more *oleracea*. Our last try of the day was at West Looe, and we worked along the small undercliff to the west of the town. Here the spurrey grew in profusion festooning the cliff-face, and we took about twenty more *barrettii* larvae.

The next day we set off for home well satisfied with the trip. *Barrettii* pupated with no trouble in a biscuit tin containing peat and subsequently produced a most varied series of moths.

1953 commenced badly from a health point of view and my wife decided to take our three sons in March to the Scilly Islands for a short holiday to get some sunshine. I was unable to go then, but by April was less busy and very envious of the tales they told on their return. I therefore decided I would have four days there. My daughter and I caught the night train from Paddington, arriving at Penzance early next morning. We drove out to the airport and arrived on St. Mary's in time for lunch. The weather was kind at first and we toured the island and also visited Tresco, with its wonderful semi-tropical gardens. The first night, 14th April, we went searching for larvae along the top of the cliff: *Amathes xanthographa* Schiffermueller were common, but there was little else except for the odd *Triphaena comes* Hubner and a few larvae on thrift that I did not recognize, but which turned out to be *Eumichtis lichenea* Hubner. The next two nights we kept more inland and found *lichenea* to be extremely common feeding on all manner of plants, especially those growing on the tops of the stone walls bordering the roadside: foodplants noted were spurrey, thrift, plantain, garlic, also bramble and veronica.

The weather generally worsened and we decided to come back a day early. The planes were not flying by then, so we returned by sea on the S.S. 'Scillonia', and were very sorry for ourselves at the end of the crossing.

The *xanthographa* turned out to be a beautiful deep rich brown form, while the *lichenea* were of a dark grey and white race. One fine form of *comes* was bred.

In June we had planned to spend our holiday on a farm on the Lizard Peninsula and duly arrived there on the 22nd. This time the weather was most unkind to us and for three days our hosts lit a fire in the sitting-room around which we sat much of the time. Cornish cream was 'on' at every meal much to our delight. When we could we explored the surrounding countryside with a view to finding suitable collecting spots, but they seemed few and far between. At dusk on 23rd June we visited Porthoustock and took four *Leucania l-album* Linnaeus flying over valerian in the cove, but nothing else. The next night we visited Poldhu Cove and collected about forty *conspersa* larvae. From these emerged some of the nicest forms I have so far taken.

On the evening of the 25th we again visited Porthoustock and took another four *l-album* and then went on to Porthallow, which had looked hopeful for *Antitype xanthomista* Hubner. Sure enough, there they were on the cliff-face feeding on thrift, ladies slipper, and *anthyllis*, but were extremely difficult to obtain owing to the steepness of the cliff and having to carry a lantern or torch in one hand.

This night and that following we collected a total of about fifty, but they soon dwindled. First of all, all the small ones died off, and some of the larger ones were kept for preserving. Of the remainder fifty per-cent were parasitised and I finished up with only five males and three females in the collection.

On the 27th we started for home, having been badly defeated by the weather, though once we had left Cornwall the sun shone brilliantly.

1955 again saw us heading west. On the night of 30th July we once again visited Hopes Nose, but this time saw no sign of *putrescens* in spite of perfect weather. We spent the night in the van and at eight o'clock next morning were on the sands at Dawlish, and this time had the place to ourselves. The weather was glorious and we walked along the tongue of land to the east and found *ripae* larva plentifully. Another three months must pass before we shall know what colour the moths will be. In the afternoon we had tea again with Mr. Lees and his sister, and also found there Messrs. R. Mere and Dobson. In the evening the latter two gentlemen and ourselves tried Ansty's Cove: the total take being a few worn *putrescens* and one *Hypsidae quadripunctaria* Poda. Early next morning, 1st August, we were on the rocks at Thurlstone when we saw a male *Colis hyale* Linnaeus flying fast and straight in from the sea about two feet above the water. It carried on over the rocks and quickly disappeared inland.

This trip is mainly memorable for the huge clouds of 'Whites' that met us wherever we drove. On 2nd August we visited Polperro and West Looe, but failed to find a single *barrettii* larva. The food-plant was almost non-existent and everywhere the earth was baked rock-hard. All the large overhanging plants of spurrey had disappeared: through what cause one could only guess, frost or storms in the winter, or lack of rain and scorching sun in the summer.

PHILUDORIA POTATORIA (L.) PARTIAL SECOND BROOD (LEP: LASIOCAMPIDAE)

In August, 1955, I had a batch of 30 *P. potatoria* eggs and kept the larvae from these in a warm cupboard, where all but four grew to the normal hibernating size and then stopped eating. They were released, while the remaining four fed up and produced female moths between 5th November and 12th December. Three were normal in appearance and one had streaks and patches of the male colouring on the forewings.

P. N. WRIGHT.

Whitehill House,
Whitehill, Bordon, Hants.
2nd February, 1956.

THE LARVA OF *LIMNEPHILUS POLITUS* McLACHLAN (TRICHOPTERA: LIMNEPHILIDAE)

By HILMY M. HANNA, B.Sc., M.Sc., F.R.E.S.
(Zoology Department, University of Reading)

On 9th May, 1953, fifty-four fully-grown larvae were collected from an open pool at Heaton Mersey, near Manchester. The larvae were found on aquatic vegetation as well as on the bottom of the pool. The adults emerged in the laboratory between 15th June and 30th July, and were identified as *Limnephilus politus*.

Case:

The cases are up to 26 mm. long and 8 mm. wide, and are made of stalks of water plants arranged obliquely, bits of leaves, seeds of water plants and mollusc shells, with a certain amount of detritus. On some of the cases specimens of a fresh-water sponge (probably *Spongilla*) were found. (Hanna, 1953). The posterior opening of the case is small and lies in the centre of a silken membrane.

Larvae:

The larva is eruciform. The larvae examined were up to 28 mm. long and 3.5-4 mm. wide. Ulmer (1909) recorded larvae up to 24 mm. long.

Head:

The clypeal band is dark brown and has a notch of lighter colour at its oral end and bears a group of dark spots at its aboral end. The dark brown bands on the genae converge to form a V. The genae have dark brown spots on their anterior and posterior surfaces as well as on their sides. The gular sclerite is golden yellow in colour and does not separate the genae completely. The genal suture is open.

Labrum:

The ventral margin of the labrum bears a small protuberance. There are two dark bands and a central dark spot on the anterior surface of the labrum. On each side of the labrum there are three long setae, two small setae and a group of fine hairs. The tormae are long, thin and bent inwards.

Mandibles:

Both the cardo and stipes bear two setae. The maxillary palp has five segments, of which the basal one carries a group of hairs, while the apical segment bears four sensillae. The lacinia has a few sensillae and a group of hairs.

Thorax:

The pronotum is entirely sclerotised and has a medium longitudinal suture. Its posterior and posterolateral margins are heavily sclerotised and are entirely black. The anterior third of the pronotum is dark

brown. Posteriorly the pronotum has a number of dark spots. The mesonotum is sclerotised except for its anterior and anterolateral margins and bears dark brown spots. The posterior and posterolateral corners are heavily sclerotised and are dark in colour. The metanotum has six small sclerites. The prosternal horn and the prosternal sclerite are present.

Legs:

The prothoracic leg is short and robust. The mesothoracic leg is slightly longer than the metathoracic leg. The inner surfaces of the femur, tibia and tarsus carry small spines. The second segment of the trochanter carries a few hairs.

Abdomen:

On the first abdominal segment there are three protuberances, of which the lateral ones bear a small number of setae. There is a group of setae round the base of the dorsal protuberance. The gill filaments are on abdominal segments two to eight. The lateral line running from segments three to eight is formed of fine hairs. Above the lateral line there is a line of three to seven sclerotised pustules on the third to seventh abdominal segments. The anal sclerite is elliptical and has four long setae and a number of short ones. The anterior half of the sclerite is dark brown and bears dark brown spots, while the posterior half is golden yellow. The anal appendages have two segments and the anal claw has an auxiliary claw at its base. The sternum of the first abdominal segment carries a group of setae. There are elliptical sclerites on the sterna of the second to the seventh abdominal segments.

The larvae of *L. politus* McLach. may be easily confused with the larvae of *L. marmoratus* Curt., *L. flavicornis* (F.), *L. stigma* Curt. and *L. rhombicus* (L.). The notch at the oral end of the clypeal band of *L. politus* is enough to distinguish the larvae of this species from the larvae of *L. marmoratus*, *L. flavicornis* and *L. stigma*. The features which distinguish the larvae of these three species from each other will be described in a future paper on *L. marmoratus* Hanna (1956). In *L. rhombicus* there are three light coloured areas on the head. One of these areas is median and is situated at the aboral end of the clypeus. The other two areas are partly contained in the clypeus and partly in the genae.

REFERENCES

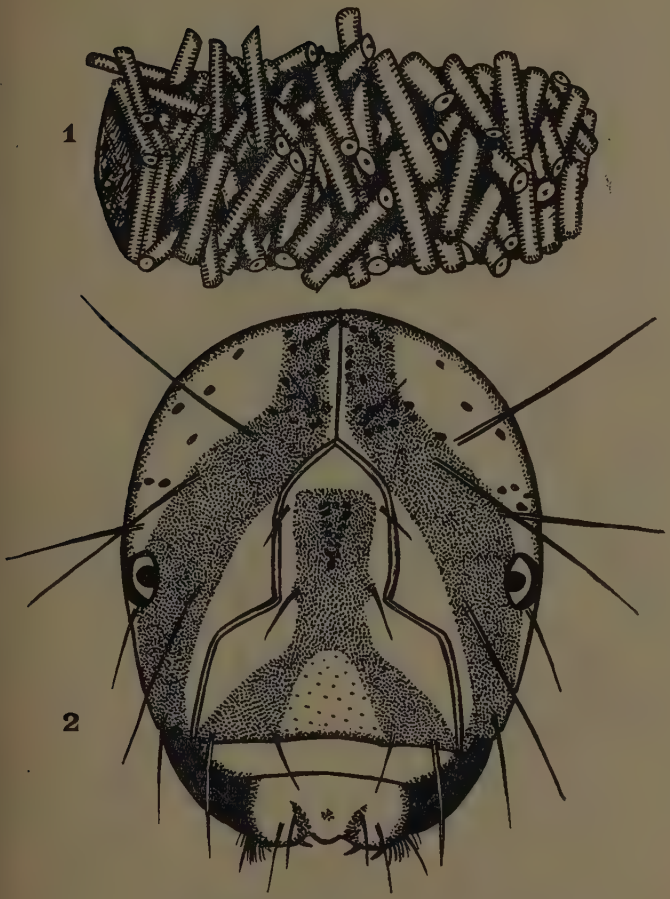
HANNA, H. M., 1953. Sponges on Caddis Cases. *Ent. mon. Mag.* **89**:145.

HANNA, H. M., 1956. The larva of *Limnephilus marmoratus* Curt. *Ent. Gaz.* (in the press).

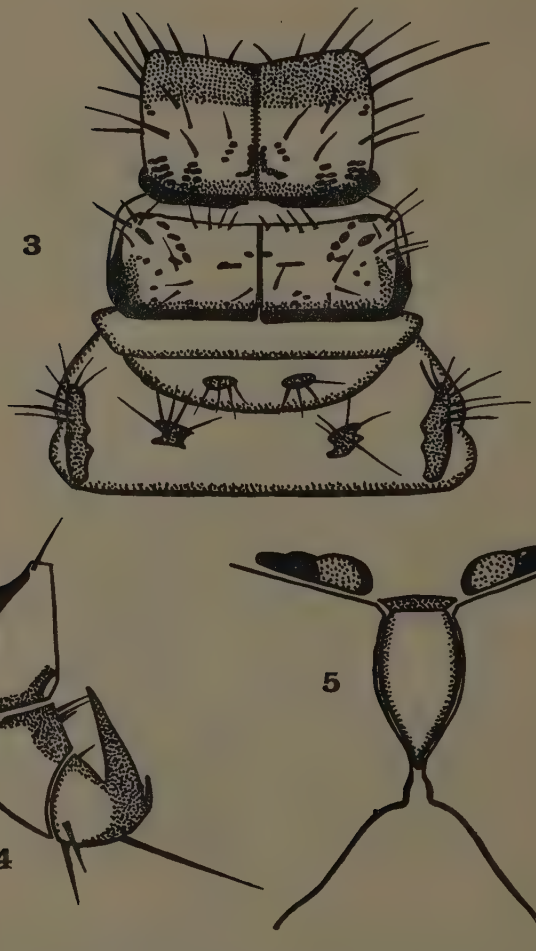
LESTAGE, J. A., 1921, in Rousseau, E. *Les larves et nymphes aquatiques des insectes d'Europe*. Brussels.

SILFVENIUS, A. J., 1904. Über die Metamorphose einiger Phryganeiden und Limnophiliden. *Acta. Soc. Fauna Flora Fenn.* **27**(2):49.

ULMER, G., 1909. *Trichoptera, Die Süsswasserfauna Deutschlands.* **5-6**:259.



LIMNEPHILUS POLITUS McLACH.
Figs. 1-2. (1) Larval case. (2) Head from the front.



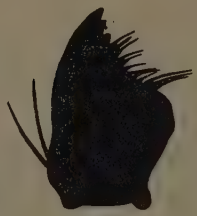
LIMNEPHILUS POLITUS McLACH.

Figs. 3-5. (3) Thoracic nota from above. (4) Anal appendage and anal claw. (5) Gular sclerite.

LIMNEPHILUS POLITUS McLACH.

Figs. 6-8. (6) Prothoracic leg. (7) Mesothoracic leg. (8) Metathoracic leg.

9



10

11

12

13

LIMNEPHILUS POLITUS McLACH.

Figs. 9-13. (9) Labrum. (10) Left mandible. (11) Right mandible. (12) Labium and maxillae. (13) Anal sclerite from above.

COLEOPHORA PARIPENNELLA ZELLER, 1839, AND A DESCRIPTION OF A NEW SPECIES PREVIOUSLY MISIDENTIFIED (LEP.: COLEOPHORIDAE)

By J. D. BRADLEY

Dept. of Entomology, British Museum (Natural History)

Coleophora paripennella Zeller was described from three specimens stated to be '. . . . wahrenscheinlich aus Böhmen'. One syntype came to the British Museum (Natural History) in Zeller's collection, and has been re-examined, the other two have not been traced.

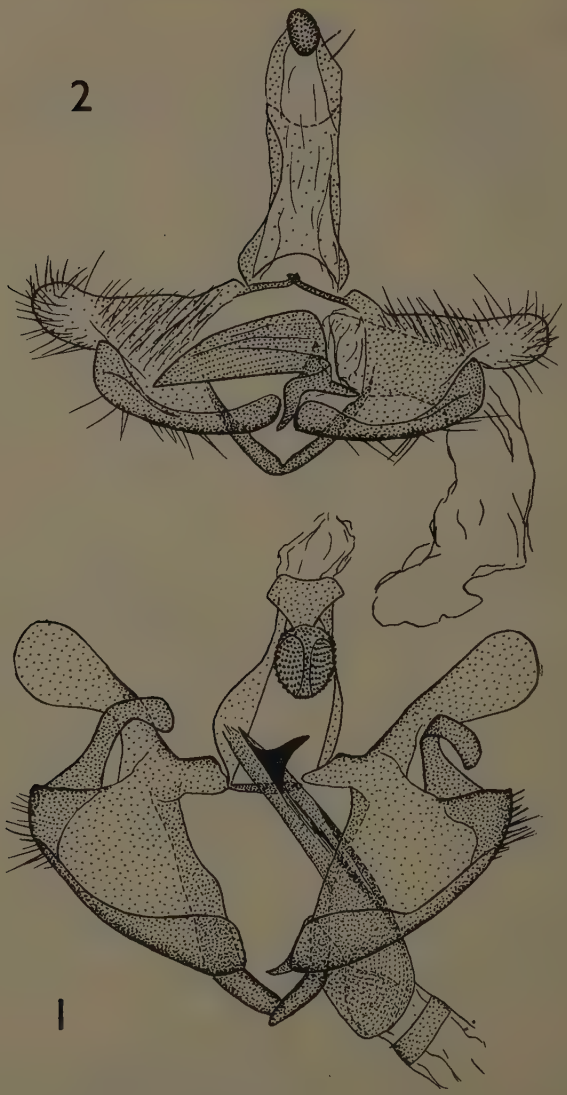
There seems no doubt of the authenticity of the specimen mentioned above. The hand-written data label affixed to it compares with similar labels attached to Zeller's other type material. In the bottom right-hand corner of the label is written 'Livon', which is presumably the locality and means Livonia. Since Zeller says in the description 'probably from Bohemia', it can only be assumed that he was doubtful whether the locality given on the label was correct.

An examination of this specimen has revealed that it belongs to a different species to the one generally known to collectors and in the literature as *paripennella*. Zeller's description of *paripennella* fits the species represented by the syntype. The other species differs in the shape and coloration of the fore wing, and, except for their white-tipped antennae, the two species bear little superficial resemblance to each other. The true *paripennella*, represented by the syntype, appears to have become confused with *alcyonipennella* Kollar, which it superficially resembles and with which it has been found mixed in collections. The species which has taken the place of *paripennella* appears to have been substituted by Zeller, who had nineteen examples determined as *paripennella* in his collection, having evidently misidentified them.

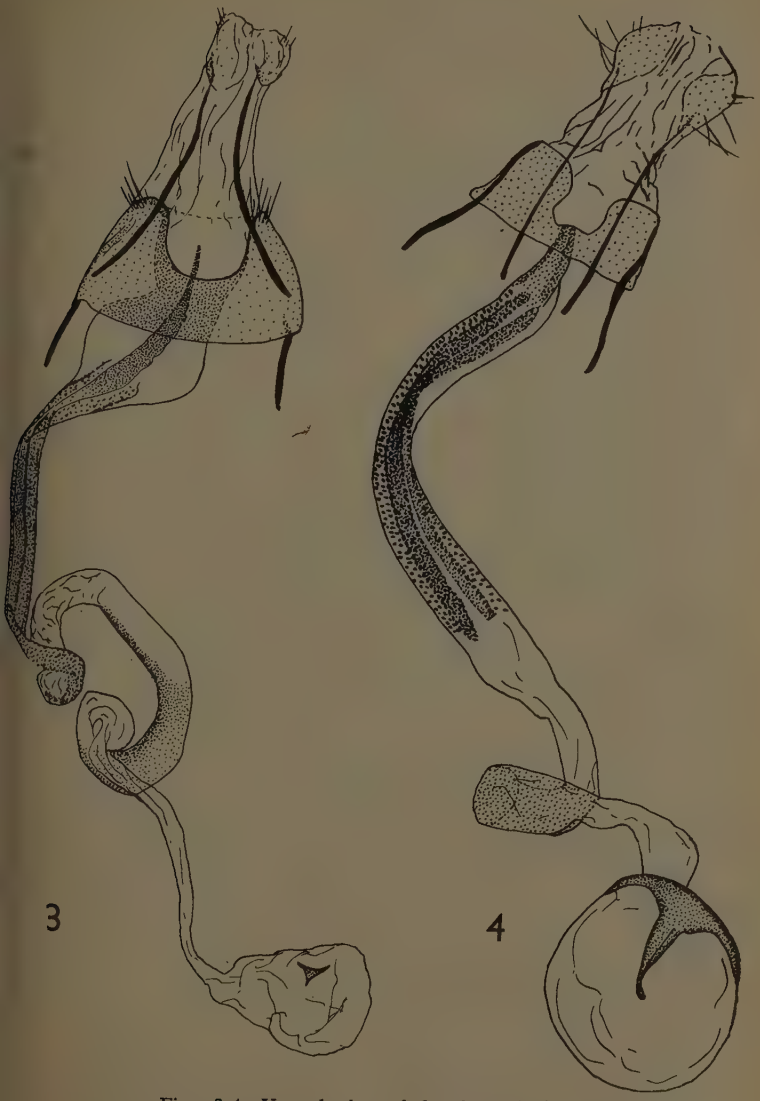
The syntype has been regarded for many years as the type of *paripennella*, and was apparently thus labelled after Zeller's collection came to the British Museum (Natural History) and before the term lectotype was adopted in the Nomenclature. Since Zeller did not indicate a type for *paripennella*, the syntype can be regarded as no more than a lectotype. The redescription of *paripennella* which follows is based upon this specimen. The species which has previously been erroneously identified as *paripennella* is apparently without a name, and is described as new.

Coleophora paripennella Zeller

Coleophora paripennella Zeller, 1839, Isis von Oken, 1839, pt.3: 208.
Coleophora alcyonipennella Kollar, Meyrick *nec* Kollar, 1928, *Revised Handbook of British Lepidoptera*, p. 750.



Figs. 1-2. Ventral view of male genitalia.
(1) *Coleophora paripennella* Zeller. (2) *C. albicornuella* sp. n.



Figs. 3-4. Ventral view of female genitalia.
(3) *Coleophora paripennella* Zeller. (4) *C. albicornuella* sp. n.

Coleophora alcyonipennella Kollar, Pierce *nec* Kollar, 1935, *The Genitalia of the British Tineina,* p. 67, pl. 40.

" " " Ford *nec* Kollar, 1949, *A Guide to the Smaller British Lepidoptera,* p. 143.

12-15mm. Labial palpus fuscous. Head smooth-scaled, shining fuscous. Thorax and tegula shining greyish bronze. Antenna greyish fuscous, apex white. Fore wing rather long and narrow, attenuated at apex, shining greyish bronze, with greenish sheen, cilia grey. Hind wing and cilia grey. Abdomen greyish fuscous.

Male genitalia as in fig. 1. The long incurved arm extending from near the apex of the sacculus is very characteristic of this species.

Female genitalia as in fig. 3. The length of ductus bursae spiculated immediately below the ostium appears to be of specific importance.

Lectotype. A type not having been indicated by Zeller, the syntype in the British Museum (Natural History), bearing a hand-written label with the data '*paripennella* F.R., Is.208, Livon 1', is designated lectotype. Genitalia slide B.M.2387.

It seems probable that *Coleophora aereipennis* Wocke is conspecific with *paripennella,* but the type of that species remains to be examined before the synonymy can be established.

C. paripennella occurs commonly in England and E. Ireland, and has a wide distribution on the Continent. The larva feeds on *Centaurea nigra* and *Arctium lappa,* constructing a straight cylindrical blackish silken case, with a whitish lateral streak, and with the mouth lateral. The cases may be found on the underside of leaves from October to June, the larva then pupating within the case low down on the stem of the food-plant or amongst rubbish on the ground. The moth emerges in June and July.

Coleophora albicornuella sp. n.

Coleophora paripennella Zeller, auctt., *nec* Zeller.

10-11 mm. Labial palpus whitish ochreous, terminal segment sometimes suffused with ochreous. Head, thorax and tegula glossy greyish brown. Antenna dark fuscous, apex white. Fore wing more or less rounded at apex, glossy greyish brown, sometimes faintly tinged with olive or dark green. Abdomen greyish fuscous.

Male genitalia as in fig. 2.

Female genitalia as in fig. 4.

Type ♂: 'England, Lee, larva on sloe and bramble, x.1890 excl. vi. 1891, Bower. 28.1.1892, Walsingham collection'. Genitalia slide B.M.4168.

Paratypes: 3 ♂ 3 ♀, same data as type. Type and paratypes in the British Museum (Natural History).

This species is allied to *ahenella* Hein., and closely resembles it in size and coloration. They may be readily separated by the antenna,

which in *ahenella* is white, with a sharply defined fuscous ring on each segment from base to apex.

C. albicornuella occurs locally in England and Europe. The larva feeds on the underside of leaves of hazel, apple, rose, bramble, sloe, buckthorn, birch and elm from July to November, dwelling in a blackish brown subcylidrical recumbent case, which has the dorsal anterior portion adorned with leaf fragments; it pupates in the case amongst rubbish on the ground. The moth emerges in May and June.

BOOK REVIEWS

An Introduction to the Study of Insects, by D. J. Borror and D. M. Delong. Illustrated, 1030 pp. Rinehart & Co., New York. Second printing, 1955. (First published in 1954.) Price 50s.

In the preface the authors justify the publication of this immense volume on the ground that it combines emphasis on both insect study and identification, and they add that the book is for beginners in college entomology and as a guide for teachers and others, and that it could 'serve as a text for an advanced course in insect classification'. Morphology and physiology are cut down 'to a minimum' so that the bulk of the book is systematic.

Each of the Orders is given a section with a key to the families, short notes about the more important ones, and a bibliography, mostly of American literature.

It is interesting to note the steady increase, with time, in the number of the Orders. The Linnean arrangement included only 9, while Packard, 1886, made 16. Imms, 1934, had 23, and this work reaches 26! The whole process of classification appears to be the formation of smaller groups, and at the other end of the series we find many genera, with but one species showing the absurdity of this perpetual hair-splitting. This excessive number of Orders and the adoption by the authors of the most recent further splitting up of families, etc., makes the book of less value to the beginners of entomology, and I feel that those of us who began systematic work on Sharp's Cambridge Natural History volumes and who taught a much lesser subdivisioning, both got and gave a better foundation than this book provides.

As a book of references it is excellent and it will prove very useful to those who already have a sound grounding in morphology, which is essential before real systematics can be attempted.

F. BALFOUR-BROWNE.

Brocklehirst, Collin,
Dumfries.
16th March, 1956.

Fliegende Kleinodien, by J. E. Schuler. Stuttgart, 1955. 4to. pp. 194. Col. frontis. and 42 col. plates. Cloth. Price in G.B. £4 10s. 0d.

This remarkable book is really an essay in colour printing of a wonderful degree of accuracy.

The insects selected are, naturally, the more spectacular and beautiful macrolepidoptera.

In a written review one is at a disadvantage in describing visual art and truly this production must be seen to be believed.

Generally speaking the plates are most successful where the insects have been set in formal manner and placed against a neutral 'linen' background. Attempts to pose dead and dried insects against natural backgrounds of flowers or vegetation are seldom, if ever, successful; fortunately only a few of the many plates in this volume are subject to this criticism. The most beautiful to your reviewer's eyes is the plate of two freshly emerged specimens of the Saturniid *Argema mittrei* from Madagascar, hanging from their empty cocoons—but the plate is marred by the introduction, in the top right-hand corner, of two other moths, one of them obviously dead and artificially posed.

None of these minor criticisms in the least detract from the extraordinary beauty of colouring, clarity and fine printing of these plates, which constitute some of the finest examples of colour printing yet seen in the field of entomology. E.W.C.

Beetles, by Dr. Jan Bechyne, translated and edited by C. M. F. Von Hayek, 158 pages, 250 illustrations, 6 colour plates, 59 diagrams. Thames & Hudson, London, 1956. Price 18s.

Here is an elementary book on the identification of some of the commoner beetles of Europe. It has been translated from the German original (*'Welcher Kaefer ist das?'*), so that the majority of species referred to do not occur in this country. Its handy size and quite beautiful plates (unhappily the names of four of the six species in Colour Plate I are mixed up) give the book a definite if limited value to the holiday goer with an entomological bent.

The brevity of the chapters on anatomy, ecology, distribution, nomenclature and collecting methods is chastening; one disapproves, of course, but there it is; quite a lot of sensible information has been packed into a few pages of widely-printed text. The introduction to the use of the key (p. 51) is a little misleading when it suggests that 'by working through the Key in this way one will eventually arrive at the generic and specific name of the Beetle'. One can sometimes get as far as the genus, at others to the family. The classification is based on Reitter's *Fauna Germanica,* and an appendix outlines Crowson's (1949-1953) Classification of the Families of the British Coleoptera.

The six coloured plates alone justify the existence of this book; the black-and-white drawings are profuse and excellent.

A. N. BRANGHAM.

AN ILLUSTRATED LIST OF THE BRITISH TORTRICIDAE

PART I: TORTRICINAE and SPARGANOTHINAE

By J. D. BRADLEY & E. L. MARTIN

In the last quarter of a century, since the publication of Meyrick's *Revised Handbook of British Lepidoptera* in 1928, the classification of the family Tortricidae has been considerably modified. This has been largely due to research into the morphology of the genitalia, and has involved a great many changes in the nomenclature.

The taxonomic value of the genitalia in determining generic relationships, and in distinguishing between the more closely related species of British Tortricidae, was demonstrated by Pierce and Metcalfe (1922, *The Genitalia of the Tortricidae*). More recently, the contributions of Dr. Nikolaus Obraztsov (1954, *Tijdschr. Ent.*, **97**: 141-231, and 1955, *Ibid.*, **98**: 147-228) to the study of the genera of the Palaearctic Tortricidae has made possible the compilation of a new systematic list of the British Tortricinae and Sparganothinae in keeping with the modern concept of these subfamilies and their nomenclature.

This new list contains many names which will be unfamiliar to collectors who have adhered to Meyrick's classification. We hope that by illustrating the wings of each species any confusion will be avoided. The illustrations are of typical forms only, since it was impracticable to include varieties as well, and where species show pronounced sexual dimorphism we have illustrated the male.

We have adopted Obraztsov's subfamily division of the Tortricidae. Thus, the Tortricidae and Eucosmidae as used in Meyrick's *Handbook* are considered as subfamilies of the family Tortricidae, the name Olethreutinae replacing that of Eucosmidae. The species *Sparganothis pilleriana* Schiff., included by Meyrick in his Tortricidae, is here placed in the subfamily Sparganothinae, of which it is the only British representative. Eighty-seven species of Tortricinae are recognized in the present list.

SPECIES ADDED TO THE BRITISH LIST SINCE THE PUBLICATION OF MEYRICK'S HANDBOOK, 1928

Austrotortrix postvittana Walk. An Australian species discovered in Britain in 1936 by Mr. F. C. Woodbridge (1937, *Entomologist*, **70**: 256), who found larvae feeding on *Euonymus* at Newquay, Cornwall. A colony is well established at Newquay, but until recently the only other report of the species having been seen elsewhere in this country was from Torquay, where several specimens are said to have been taken (record not published so far as known). In 1955 it was discovered in South Cornwall, where the larva has been found on several kinds of ornamental shrub.

In Australia and Tasmania *postvittana* is polyphagous on a number of native plants, but with the development of the apple and citrus growing industry became a pest on these fruit trees. It was introduced some years ago to New Zealand, where it also attacks apple, and to the Hawaiian Islands. It is not known to feed on apple in England.

Ptycholomoides aeriferana H.-S. First recorded in Britain by Dr. H. Scott (1952, *Entomologist,* **85**: 170) from Ashford, Kent. It has since been taken at Elham Park Woods, part of the State Forest near Baram (Wakely, 1953, *Entomologist,* **86**: 302, and 1955, *Ibid.,* **88**: 141), and more recently by Mr. J. H. Styles (1955, *Entomologist,* **88**: 82) in Harling Forest, Norfolk, which forms part of Thetford Chase.

The larva feeds between larch needles, spinning them together for protection, and pupates within this covering. The moths fly during June and July, and will come to light.

Adoxophyes orana F. v. Rösl. A species which in recent years has become common on the Continent and spread to Britain, where it was discovered in 1952 (Bradley, *Entomologist,* **85**: 1) causing damage to apple orchards in Kent. It has since been reported occurring in Essex.

This species is double brooded in Britain, the first from larvae which overwinter in the second instar, the moths from these emerging in June and commencing to lay at once to produce a second brood of moths in August. The larva shows a preference for apple, feeding between the spun leaves, but will feed on the foliage of various other trees. The moths of the second or late summer brood of moths lay small batches of eggs on the fruit of apple. The larvae hatching from these scar the surface of the fruit before going into hibernation.

The male will come to light.

Lozotaeniodes formosana Fröl. Recorded from Britain by Mr. R. W. Parfitt (1947, *Entomologist,* **70**: 225), and apparently has since spread in Southern England, including the Isle of Wight.

The larva feeds on Scotch fir (*Pinus sylvestris*) in April and May, living within a silken tube spun along a twig near the terminal shoot. The moth emerges in July and August, and will come to light.

A doubtful British species

Paramesia gnomana Cl. We have included this species in our list but it seems doubtful whether it can continue to be regarded as British unless fresh records are forthcoming. It appears to have held a rather dubious place in the British list from the time it was added more than eighty years ago by Barrett (1872, *Ent. mon. Mag.,* **9**: 129). Some fourteen or fifteen years earlier J. B. Hodgkinson had sent three specimens taken by a local collector to the Rev. Henry Burney under the name of *Tortrix costana.* He considered them to be *Tortrix latiorana,* and sent them to Barrett for examination and

they were found to be *gnomana*. Unfortunately the locality was not recorded by the collector and after such a lapse of time could not be traced. Barrett later doubted the correctness of the record (1904, *The Lepidoptera of the British Islands*, **10**: 214), and Meyrick (1928, *Revised Handbook of British Lepidoptera*, p. 501) likewise suggested that there was probably some error.

There is, however, a possibility that *gnomana* has been overlooked due to its superficial resemblance to *Clepsis costana* Schiff. The two species could easily be confused although they belong to different genera. They can be readily separated by differences in the wing venation of the fore wings, *gnomana* having veins 7 and 8 stalked, while in *costana* these veins are separate.

Paramesia gnomana occurs in Central and Southern Europe, where it is found in the Alps up to 5,000 feet, and in Southern Scandinavia and Asia Minor. The larva feeds on the leaves of deciduous trees and on *Vaccinium myrtillus, Stachys* and *Iris*. The moth flies in June, July and August.

A NEW SYNONYM

Exapate duratella Heyd. Eight specimens determined as *duratella* Heyd. were taken by Mr. A. E. Griffith at Strathnaver, Sutherland, and are now in his collection in the National Museum of Wales, Cardiff. We have examined this material, and also Continental specimens determined as *duratella*, and believe the species to be conspecific with *congelatella* Cl., and have therefore placed *duratella* as a synonym of *congelatella* in our list.

SYSTEMATIC LIST OF GENERA AND SPECIES

TORTRICIDAE

TORTRICINAE

1. PANDEMIS Hübner
1. corylana Fabricius
2. cinnamomeana Treitschke
3. heparana Schiffermüller & Denis
4. cerasana Hübner
= ribeana Hübner
5. dumetana Treitschke

2. ARGYROTAENIA Stephens
6. pulchellana Haworth
= politana Haworth

3. CHORISTONEURA Lederer
7. diversana Hübner

4. CORNICACOECIA Obraztsov
8. lafauryana Ragonot

5. ARCHIPS Hübner
=CACOECIA Hübner
9. piceana Linné
10. oporana Linné
= podana Scopoli
11. decretana Treitschke
12. crataegana Hübner
13. xylosteana Linné
14. rosana Linné
15. hebenstreitella Müller
= sorbiana Hübner

6. CACOECIMORPHA Obraztsov
16. pronubana Hübner

7. SYNDEMIS Hübner
17. musculana Hübner

8. AUSTROTORTRIX Bradley
18. postvittana Walker

9. PTYCHOLOMOIDES Obraztsov
19. aeriferana Herrich-Schäffer

10. AMELIA Hübner
20. viburnana Schiffermüller & Denis
21. paleana Hübner

11. CLEPSIS Guenée
22. senecionana Hübner
= rusticana Treitschke
23. rurinana Linné
= semialbana Guenée
24. consimilana Hübner
= unifasciana Duponchel

25. costana Fabricius
12. ADOXOPHYES Meyrick
26. orana Fischer von Röslerstamm
13. PTYCHOLOMA Stephens
27. lecheana Linné
14. LOZOTAENIA Stephens
28. forsterana Fabricius
15. LOZOTAENIODES Obraztsov
29. formosana Frölich
16. PARAMESIA Stephens
30. gnomana Clerck
17. PARACLEPSIS Obraztsov
31. cinctana Schiffermüller & Denis
18. EPAGOGE Hübner
32. grotiana Fabricius
19. CAPUA Stephens
33. vulgana Frölich
= favillaceana Hübner
20. PHILEDONE Hübner
34. gerningana Schiffermüller & Denis
21. PHILEDONIDES Obraztsov
35. prodromana Hübner
22. BATODES Guenée
36. angustiorana Haworth
23. PSEUDARGYROTOZA Obraztsov
37 conwagana Fabricius
24. OLINDIA Guenée
38. schumacherana Fabricius
= ulmana Hübner
25. ISOTRIAS Meyrick
39. trifasciana Dononvan
= rectifasciana Haworth
26. EULIA Hübner
40. ministrana Linné
27. CNEPHASIA Curtis
41. conspersana Douglas
42. longana Haworth
43. pasiuana Hübner
44. chrysantheana Duponchel
45. octomaculana Curtis
46. communana Herrich-Schäffer
47. interjectana Haworth
= virgaureana Treitschke
48. genitalana Pierce & Metcalfe
28. CNEPHASIELLA Adamczewski
49. incertana Treitschke
29. TORTRICODES Guenée
50. tortricella Hübner
30. EXAPATE Hübner
51. congelatella Clerck
= duratella Heyd.
31. NEOSPHALEROPTERA Réal
52. nubilana Hübner
32. EANA Billberg
53. incanana Stephens
54. bellana Curtis
55. colquhounana Barrett
56. osseana Scopoli
57. argentana Clerck
33. ALEIMMA Hübner
58. loeflingiana Linné
34. TORTRIX Schiffermüller & Denis
59. viridana Linné
60. forskåleana Linné
35. SPATALISTIS Meyrick
61. bifasciana Hübner
36. ARGYROTOZA Stephens
62. bergmanniana Linné
63. comariana Zeller
64. schalleriana Linné
= logiana Schiffermüller & Denis
65. latifasciana Haworth
= schalleriana auctt.
66. caledoniana Stephens
37. ACLERIS Hübner
=PERONEA Curtis
67. aspersana Hübner
68. maccana Treitschke
69. variegana Schiffermüller & Denis
70. permutana Duponchel
71. hyemana Haworth
= mixtana Hübner
72. lipsiana Schiffermüller & Denis
73. rufana Schiffermüller & Denis
74. sparsana Schiffermüller & Denis
= sponsana Fabricius
75. hastiana Linné
76. cristana Schiffermüller & Denis
77. logiana Clerck
= niueana Fabricius
78. umbrana Hübner
79. lorquiniana Duponchel
80. holmiana Linné
81. boscana Fabricius
82. ferrugana Schiffermüller & Denis
83. tripunctulana Haworth
= fissurana Pierce & Metcalfe
84. shepherdana Stephens
85. rhombana Schiffermüller & Denis
= contaminana Hübner
86. emargana Fabricius
= caudana Fabricius
87. literana Linné

SPARGANOTHINAE

38. SPARGANOTHIS Hübner
88. pilleriana Schiffermüller & Denis

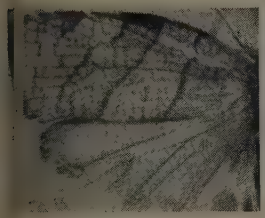
INDEX TO GENERA AND SPECIES

In the list of species, the letters a, b, c, which follow the plate numbers refer to the left-hand, centre and right-hand columns respectively.

Species	Plate
nubilana Hb.	6c
octomaculana Curt.	5c
oporana L.	2a
orana F. v. Rösl.	3c
osseana Scop.	7a
paleana Hb.	3a
pasiuana Hb.	5c
permutana Dup.	8c
piceana L.	1c
pilleriana Schiff.	10c
podana Scop. (oporana)	2s
politana Haw. (pulchellana)	1b
postvittana Walk.	2c
prodromana Hb.	4c
pronubana Hb.	2c
pulchellana Haw.	1b
rectifasciana Haw. (trifasciana)	5a
rhombana Schiff.	10b
ribeana Hh. (cerasana)	1b
rosana L.	2b
rufana Schiff.	9a
rurinana L.	3b
rusticana Tr. (senecionana)	3b
schalleriana auctt. (latifasciana)	8a
schalleriana L.	8a
semialbana Guen. (rurinana)	3b
senecionana Hb.	3b
schumacherana Fb.	5a
shepherdana Steph.	10a
sparsana Schiff.	9a
sponsana Fb. (sparsana)	9a
sorbiana Hb. (hebenstreitella)	2b
tortricella Hb.	6b
trifasciana Don.	5a
tripunctulana Haw.	10a
ulmana Hb. (schumacherana)	5a
umbrana Hb.	9b
unifasciana Dup. (consimilana)	3b
variegana Schiff.	8b
viburnana Schiff.	3a
virgaureana Tr. (interjectana)	6a
viridana L.	7b
vulgana Fröl.	4b
xylosteana L.	2b

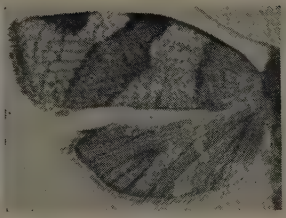
ORTRICINAE

PANDEMIS Hb.



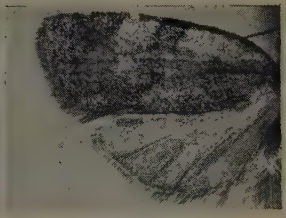
corylana Fb.

PANDEMIS Hb.



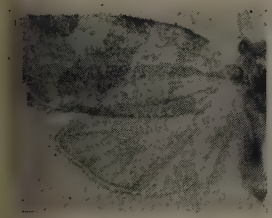
cerasana Hb.

CHORISTONEURA Led.

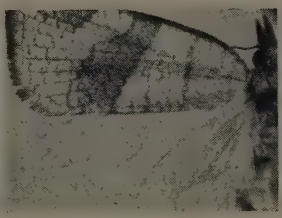


diversana Hb.

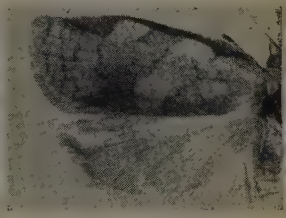
CORNICACOECIA Obr.



cinnamomeana Tr.

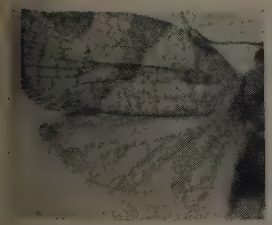


dumetana Hb.



lafauryana Rag.

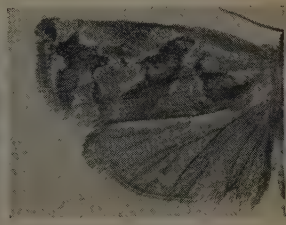
ARGYROTAENIA Steph.



heparana Schiff.

pulchellana Haw.

ARCHIPS Hb.



piceana L.

ARCHIPS Hb.

oporana L.

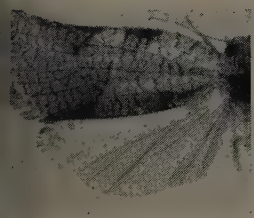
ARCHIPS Hb.

xylosteana L.

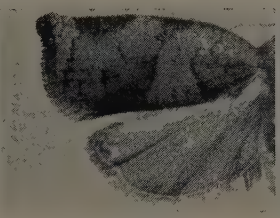
CACOECIMORPHA Obr.

pronubana Hb.

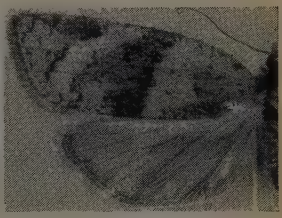
SYNDEMIS Hb.



decretana Tr.

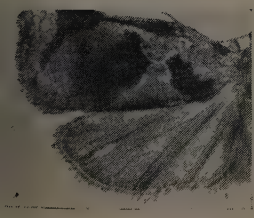


rosana L.

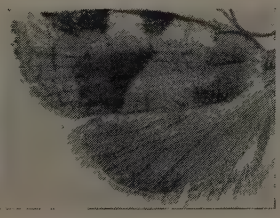


musculana Hb.

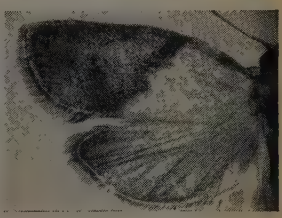
AUSTROTORTRIX Brad.



cratægana Hb.

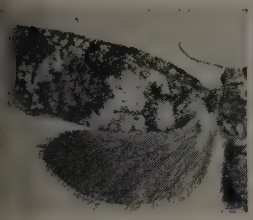


hebenstreitella Müll.



postvittana Wlk.

'CHOLOMOIDES Obr.

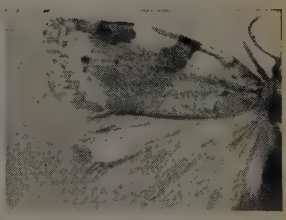


æriferana H.-S.

CLEPSIS Guen.

senecionana Hb.

CLEPSIS Guen.



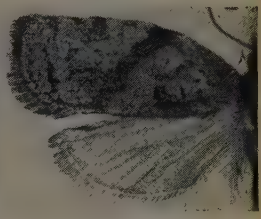
costana Fb.

AMELIA Hb.

viburnana Schiff.

rurinana L.

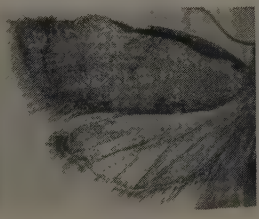
ADOXOPHYES Meyr.



orana F.v.Rösl.

PTYCHOLOMA Steph.

paleana Hb.



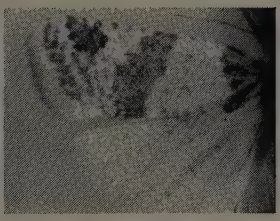
consimilana Hb.

lecheana L.

OZOTAENIA Steph.

forsterana Fb.

PARACLEPSIS Obr.

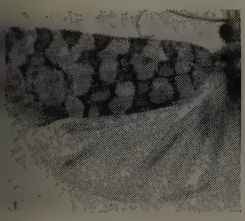


cinctana Schiff.

PHILEDONE Hb.

gerningana Schiff.

)ZOTAENIODES Obr.

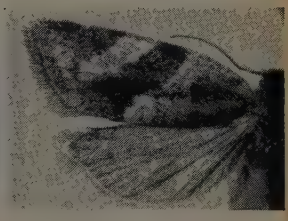


formosana Fröl.

EPAGOGE Hb.

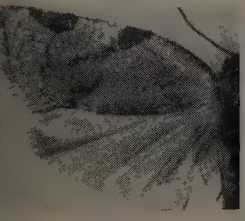
grotiana Fb.

PHILEDONIDES Obr.



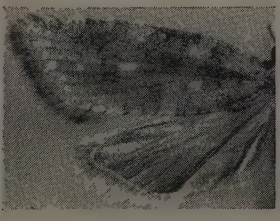
prodromana Hb.

PARAMESIA Steph.



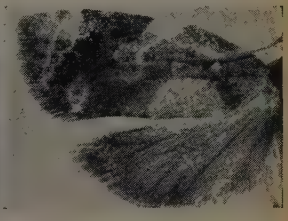
gnomana Cl.

CAPUA Steph.



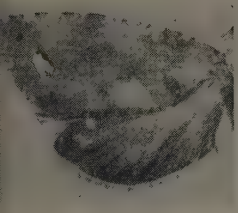
vulgana Fröl.

BATODES Guen.



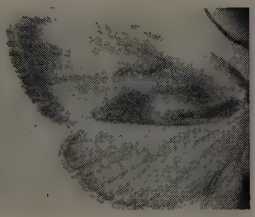
angustiorana Haw.

UDARGYROTOZA Obr.



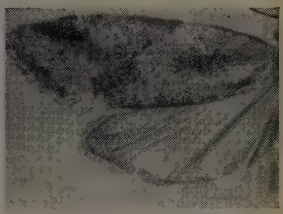
conwagana Fb.

EULIA Hb.



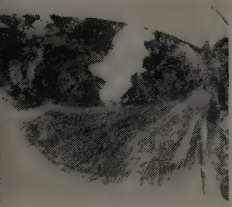
ministrana L.

CNEPHASIA Curt.



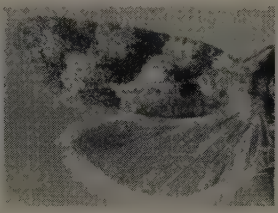
pasiuana Hb.

OLINDIA Guen.

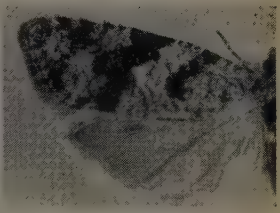


schumacherana Fb.

CNEPHASIA Curt.

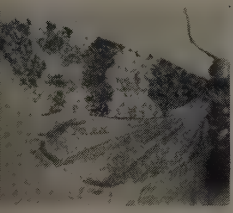


conspersana Dougl.

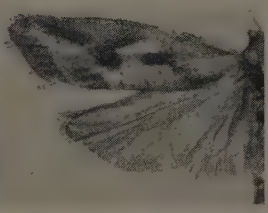


chrysantheana Dup.

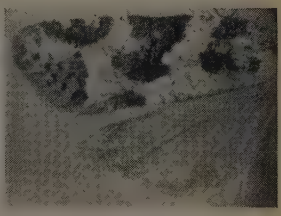
ISOTRIAS Meyr.



trifasciana Don.

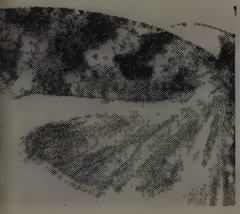


longana Haw.



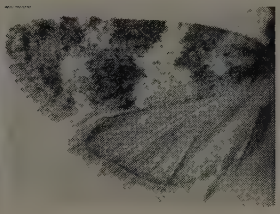
octomaculana Curt.

CNEPHASIA Curt.



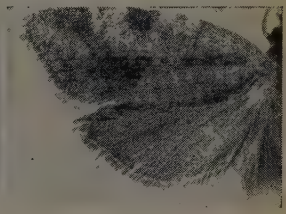
communana H.-S.

CNEPHASIELLA Adamcz.



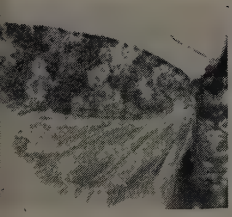
incertana Tr.

NEOSPHALEROPTERA Réal.

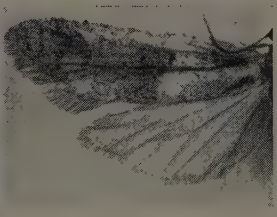


nubilana Hb.

TORTRICODES Guen.



interjectana Haw.



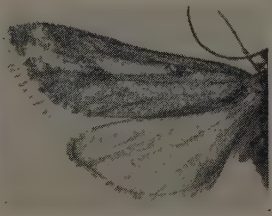
tortricella Hb.

EANA Billb.

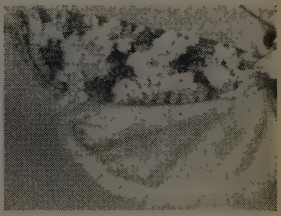
incanana Steph.

EXAPATE Hb.

italana Pierce & Metc.

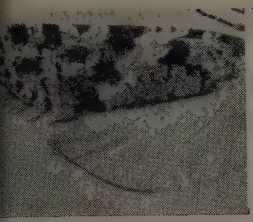


congelatella Cl.



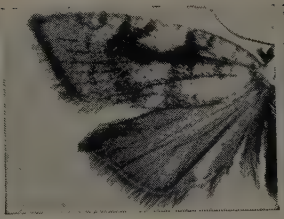
bellana Curt.

EANA Billb.



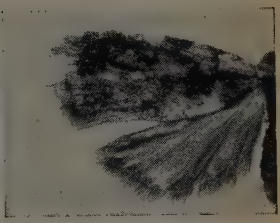
colquhounana Barr.

ALEIMMA Hb.



loeflingiana L.

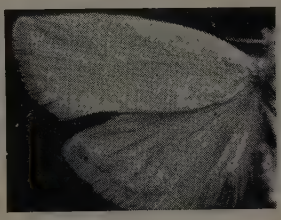
SPATALISTIS Meyr.



bifasciana Hb.

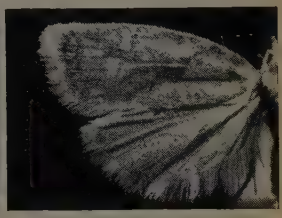
TORTRIX Schiff.

osseana Scop.



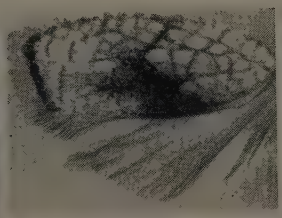
viridana L.

ARGYROTOZA Steph.

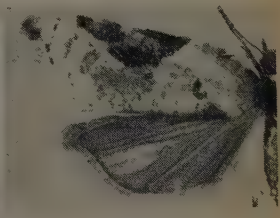


bergmanniana L.

argentana Cl.



forskâleana L.

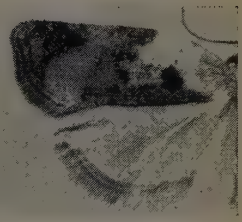


comariana Zell.

RGYROTOZA Steph. **ACLERIS Hb.** **ACLERIS Hb.**

schalleriana L.

aspersana Hb.



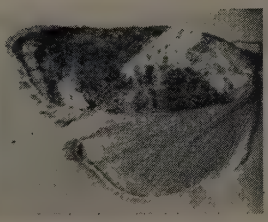
permutana Dup.

latifasciana Haw.

maccana Tr.

hyemana Haw.

caledoniana Steph.



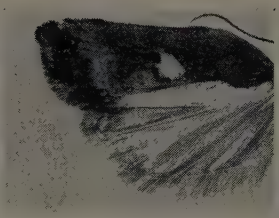
variegana Schiff.

lipsiana Schiff.

ACLERIS Hb.

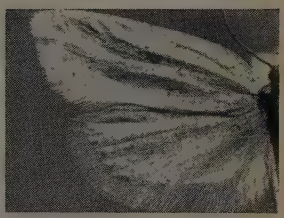
rufana Schiff.

ACLERIS Hb.

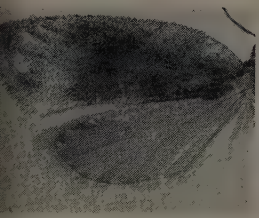


cristana Schiff.

ACLERIS Hb.

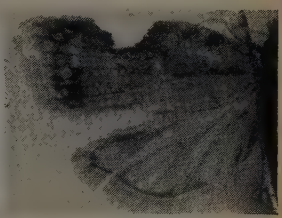


lorquiniana Dup.

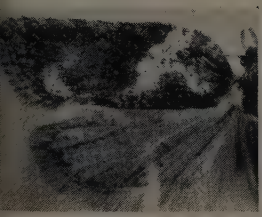


sparsana Schiff.

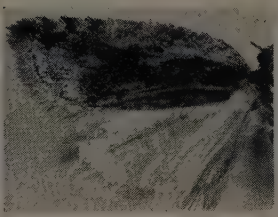
logiana Cl.



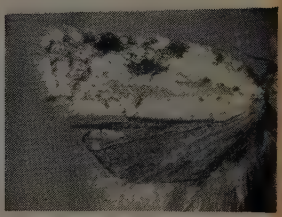
holmiana L.



hastiana L.



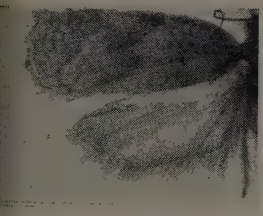
umbrana Hb.



boscana Fb.

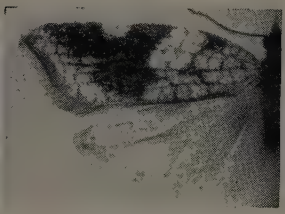
SPARGANOTHINAE

ACLERIS Hb.



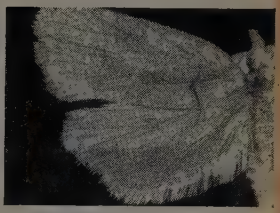
ferrugana Schiff.

ACLERIS Hb.

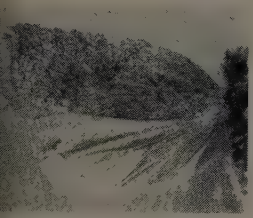


rhombana Schiff.

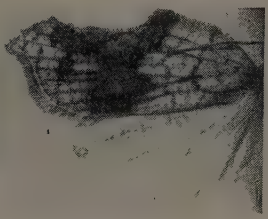
SPARGANOTHIS Hb.



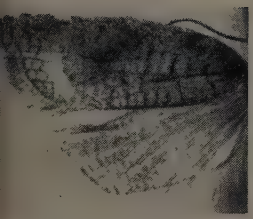
pilleriana Schiff.



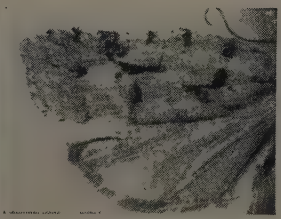
tripunctulana Haw.



emargana Fb.



shepherdana Steph.



literana L.

SOME NOTES ON THE ECOLOGY OF THE AQUATIC AND SEMI-AQUATIC HEMIPTERA-HETEROPTERA AND THEIR ASSOCIATED FAUNA AND FLORA IN SOUTHERN HERTFORDSHIRE AND NORTH-EASTERN MIDDLESEX

By I. LANSBURY

(Continued from page 111.)

SECTION III

Cymatia bonsdorffi: Very scarce, only two recorded from the survey area; both of these were macropterous females and obviously migrants. Some notes on its distribution in Herts. were published by Lansbury (1953), Brown (1941, 1943) gives notes on its geographical distribution and suggested that the lack of suitable habitats, i.e., acid pools and tarns, was the reason for its absence from Herts., at the time of writing. For this reason the species is only likely to occur occasionally in the macropterous form. The majority of *C. bonsdorffi* are usually brachypterous, and this would indicate a breeding population.

Cymatia coleoptrata: Found only in **7.**, where it was the dominant Corixid, 116 were collected. This species has a strong predilection for habitats where there is plenty of submerged vegetation, i.e., *Ceratophyllum,* often with *Lemna* on the surface, Lansbury (1955) gives some details of the ecology of *C. coleoptrata* in Herts., and Kent. Watching this Corixid in an aquarium in conditions approximating to its natural habitat it will be observed that it rarely leaves the shelter of the submerged vegetation or ventures to swim in open water. Records of the distribution in Herts. of *C. coleoptrata* were published by Lansbury (1953).

Corixa punctata: Found in every habitat other than **5.**, 230 were collected. In **1.** and **3.** it was usually found in clumps of *Glyceria,* in **2.** amongst the *Ceratophyllum.* In **4.**, where it was possibly the dominant Corixid, the favourite haunt seemed to be amongst the dead leaves on the bottom. The total number of specimens from **4.** is not much greater than from **1.**, this was due to the difficulty of making satisfactory collections from **4.** on several occasions. In other habitats *C. punctata* appeared fairly regularly, but never very commonly. Populations seemed to vary from month to month, this may have been due to migration between habitats. It is of interest to record it breeding in **9.**, the nymphs were found on several occasions. In this habitat it was found where the water was about two feet deep and some vegetation was present, i.e., *Potamogeton* sp.

Corixa dentipes: Found only **4.**, 15 were collected. This is the only locality in Herts., where *dentipes* has been recorded. On 22nd November, 1953, thirty *Corixa* were collected from **4.**; on examination three males and one female were found to be *C. dentipes.* On

the 26th November seventy *Corixa* were collected and eight females and two males were found to be *C. dentipes*. From these figures it would appear that about one seventh of the *Corixa* population were *C. dentipes* at the time. It is interesting to record that *C. punctata* was the dominant Corixid as far as can be ascertained. It seems possible that in general, where *C. punctata* is the dominant Corixid, a small colony of *C. dentipes* might also be found. Lansbury (1954) compares this habitat with others in lit. from which *C. dentipes* has been recorded.

Sigara dorsalis: One of the commonest Corixids, recorded from every habitat other than **8**., 1,000 were collected, the majority of these were from **3**. and **9**. In several habitats *S. dorsalis* exhibited rather curious behaviour patterns. The population in **9**. during March, April and May 1953 was very large, the ratio of males to females 1-2. Many nymphs were found in late May and the whole of June; the habitat was not visited during July and August. In September, however, the population had fallen drastically, very few adults of *S. dorsalis* were present. This absence continued throughout the winter up to the following March 1954, when a slight increase in the population was noted. A lack of rain through most of April caused the stream level to drop considerably. A collection made on the 23rd April produced three *S. dorsalis*. This variation of the *S. dorsalis* population seems to indicate that there is a variable cycle present, dependent on environmental conditions, i.e., current running and/or degree of stagnation. The cycle in normal years may be described as follows:—The population is at its peak normally in late March and April, the adults pair and eggs are laid in late April and probably throughout the whole of May. The nymphs mature from about August onwards and then migrate elsewhere, returning to the habitat the following spring. This pattern was fairly clear early in 1954, but later the numbers dropped; this may have been due to the lack of rain and consequent stagnation of the stream, causing the *S. dorsalis* to migrate.

It is important to note that sampling with a hand net around the margins of ponds produced very few *S. dorsalis*, whereas when sampling the centre of **1**., **2**., **3**., **4**. and **10**. with a dredge net numerous *S. dorsalis* were found. It is highly possible that micro-temperatures, type and amount of vegetation and degree of stagnation are primary factors in the distribution within a habitat. It was found at Barnet that *S. dorsalis* was only common in the centre of ponds and in the stream when conditions were suitable. These are summarized below. It is very probable that in these micro-habitats temperatures are on the whole lower than they are around the margins of ponds or in streams when they are stagnant,

Listed below are a series of factors which seem to affect *S. dorsalis* and play a major part in its distribution within a habitat. These factors below are based on the results of work about Barnet, and

not conditions prevailing in the British Isles generally. They should be considered in relationship to the work of Macan, Walton, Brown and Popham listed in the bibliography.

a. Fairly constant temperature. *b.* Water clear, without masses of algae and detritus in the habitat. *c.* An open habitat; i.e., occasional or continuous flow of water, *d.* Moderately deep water, almost certainly this is connected with the temperature factor.

Factors which do not seem to affect *S. dorsalis* are: *a.* pH factor. *b.* Other insects living in association with it. *c.* The size of the habitat.

Sigara limitata: Recorded from **1.**, **3.**, **4.**, **9.** and **10.**, 1366 were collected. *S. limitata* was dominant in **1.** and **10.**; the numbers collected from these two habitats were 1127 and 255 respectively. From all the other habitats only eight were collected, the majority after August, so they were almost certainly immigrants from either **1.** or **10.** *S. limitata* had very strongly defined habitat preferences in both these ponds. It was always found most commonly in the shallow regions, especially those free from vegetation and with the bottom covered with a silty detritus. In the deeper parts of **1.** and **10.** it was very scarce. The population over a period of twelve months showed some interesting fluctuations; these are shown in a histogram. The following notes are purely conjectural concerning the populations of these two habitats. In **1.** during the winter months *S. limitata* seemed to be dispersed over the pond generally, particularly in water which was about one foot deep, where the temperature fluctuation was a good deal less than in the shallow regions around the margins. The large collection made in March was from Locus *A.;* it is possible that *S. limitata* was swarming here preparatory to pairing. At this time there was an equal number of males and females, but the April collection from Locus *A.* showed a marked drop in the number of males. The majority of males probably died off after pairing and had almost disappeared by May; the females were, however, still present in some numbers. No collections were made in June or July as it was felt that the *S. limitata* would have been predominantly immature; the collection made in August produced many teneral specimens. Again the sex-ratios were unequal, but in September the number of females dropped considerably and equality persisted for the remainder of the year with a gradual decline in the number of individuals. It is possible that if the early part of the winter 1953-54 had been colder there would have been a rather more pronounced falling off of the population in November and December. *S. limitata*'s ecology in **10.** was rather different. There it was associated with *S. lateralis* as opposed to *S. nigrolineata* and *S. scotti* in **1.** It seems possible that a good deal of migration took place in **10** from one zone to another during 1953. This pond had a silty zone comparable to Locus *A.* in **1**, but differed in being heavily polluted; this may have caused local migrations when this area was badly affected and

may account for the apparent fluctuation of *S. limitata* and other species in this zone. The histogram illustrating the population variation over nine months of the year does not seem to offer much clue to *S. limitata*'s cycle in **10**. From a study of these two differing habitats it has been possible to arrange a table showing the characteristics of these ponds and list probable reasons for its abundance or otherwise.

1.	**10.**
Open habitat	Closed habitat
pH reaction acid	pH reaction neutral
No apparent pollution	Pollution, at times fairly heavy

It will be seen that **1** and **10** are very dissimilar in some respects; things they have in common are:—. . . . gravel bottoms, with variable amounts of detritus; no apparent vegetation in the local points of *S. limitata*'s micro-distribution in both habitats and very shallow water. It does seem possible that the presence or absence of these conditions may be of some importance as to whether *S. limitata* breeds in a habitat or not.

Sigara nigrolineata: Very uncommon outside **1**., recorded from **1**., **8**., **9**. and **10**., 414 were collected, of these 400 were from **1**. *S. nigrolineata* was only found in Locus *A*. Fifteen were collected from other parts of the pond during 1953. The histogram illustrating population variation and sex-ratios shows some similarities with *S. limitata*. During the first four months of the year there was a gradual increase in numbers, with the spring peak in April, sex-ratios were not very stable during this period. In May the population had started to fall off. The eggs were probably laid in late April and May; no collections were taken in June or July, and the August one produced very few *S. nigrolineata*. The males seemed to be much longer in reaching the secondary peak in the autumn. The equality of sexes did not occur until November; this may have been due to a hangover of old females. The pattern through the winter seemed to be fairly consistent. It is obvious from these investigations about Barnet that *S. nigrolineata* in this area is a species of very restricted habitat preferences. It is believed that it is unusual to find this species commonly in acid habitats in southern Britain. Brown (1948) is of the opinion that *S. nigrolineata* prefers running water, and states that it thrives in strongly acid peat pools in mountainous areas. It is probable, however, that acidity or alkalinity within reasonable limits is of secondary importance; the controlling factors probably being degree of openness, amount of vegetation, type of bottom, per cent o.m.s. and competition from other species. This last factor is rather important when one considers that three species occurred abundantly in what was apparently a restricted locus in **1**.

Sigara scotti: Found in **1**. and **3**., the only locality in Herts., from which *S. scotti* has been recorded, 558 were collected; those found in **3**. were obviously migrants from **1**. *S. scotti* is mainly found in the

north and west of Britain. Another species, *S. fossarum*, rather similar in appearance, is found in the south and east, but they appear to overlap considerably. *S. scotti* was found commonly in most parts of **1.** other than the centre. Unlike *S. limitata* and *S. nigrolineata*, it appeared to have a far more general distribution about the margins and it was dominant in Locus *C.* For some reason no *S. scotti* were found in January and February 1953, although it was present in collections made in late 1952. The spring population climax seemed to occur very late compared with other breeding Corixids. The female population fluctuated considerably; this may have been due to bad sampling. Teneral specimens were found in August and September. Whilst collecting in August it was noticed that when *S. scotti* was exposed to sunlight in the net, numbers flew away. According to Bedwell (1945) the nearest counties to Herts., from which *S. scotti* has been recorded are Berkshire and Buckinghamshire. It is most unlikely that *S. scotti* will become common and generally distributed in this part of Britain owing to the lack of suitable habitats, i.e., peat pools and tarns. Although common in **1.**, the population did not reach the same numbers as it does within its normal geographical range, where apparently it is found in very large numbers.

Sigara fossarum: Fairly common, recorded from **1.**, **4.**, **5.**, **6.** and **10.**, 168 were collected. The majority of the *S. fossarum* were found in **1.** This species was usually found in small numbers around the margins and commonly about the island. It seems very probable that *S. fossarum* moved about **1.** in small swarms continuously. Evidence of this tendency is shown by the following data. When collecting around the island in October, 1953, a fairly large population was found, but none near Locus *B.*, whilst in November, 1953, the position was reversed. In **6.** it was found in small numbers around the margins, in October, 1953, a large swarm was seen swimming in association with *H. linnei* near the bottom. *S. fossarum* is a species which seems to be commonest in clayey ponds; Brown (1948) comments on *S. fossarum*'s predilection for this type of habitat.

Sigara falleni: Fairly common, recorded from **1.**, **2.**, **3.**, **4.**, **5.**, **6.**, **9.** and **10.**, 185 were collected. Like *S. fossarum, S. falleni* seemed to wander about habitats, although investigations of the *S. falleni* population in **10.** seemed to indicate that this might be a regular movement. When collecting during the evening from **10.** in May from the marginal areas, moderately large populations were found; collecting from the same areas at midday produced few *S. falleni.* Later in the year collecting from the deeper parts of the pond at midday *S. falleni* was found quite commonly. Thus it would appear that *S. falleni* spends the hours of strongest daylight in the deeper parts of a habitat and moves inshore when the light has passed its maximum intensity. There are certainly other factors to be considered in this suggested migration other than light, perhaps the amount of cover, food preferences, predators and pollution are involved. In

all the other habitats *S. falleni*'s appearance was rather erratic. Whether it bred anywhere other than **10.** is a matter of some conjecture. Brown (1948) found *S. falleni* commonly in the River Lea; it was scarce in **9.**, almost certainly due to the fact that the stream was too shallow and small.

Sigara distincta: Common, recorded from **1.**, **2.**, **3.**, **4.**, **5.**, **6.**, **9.** and **10.**, 411 were collected. *S. distincta*'s focus was **1.**; the majority of *S. distincta* were found in Loci *E.* and *F.* Almost invariably it was found in association with *S. dorsalis.* In **10.** a curious relationship was discovered. In acid habitats *S. distincta* usually replaces *S. falleni* in association with *S. dorsalis.* In alkaline, *S. falleni* replaces *S. distincta.* In **10.**, however, there appeared to be a fairly large *S. distincta* population, with *S. dorsalis* and *S. falleni* also common. It would appear from information available that *S. distincta* is much more common in the north of Britain where suitable habitats, i.e., acid pools, are more frequent.

Sigara lateralis: Rather scarce, recorded from **1.**, **3.**, **4.**, **7.**, **9.** and **10.**, 136 were collected. This species was most common in **10.**, *S. lateralis* is a typical cattle pond species, like other species in this habitat numbers fluctuated considerably. It was always found about the more silty margins of **10.**; these were generally the parts most heavily polluted. This species probably bred in **7.** and **10.**, although in **7.** it was confined to a rather restricted zone. A small part of this pond had been made accessible to cattle and silting had resulted, thus making conditions suitable for *S. lateralis.*

Sigara concinna: Only two collected, one from **9.** and one from **10.**, both obviously migrants. Brown (1954) found *S. concinna* to be a fairly common migrant at Rothamsted. Walton in Pearce and Walton (1939) gave some details of a habitat where *S. concinna* was very common. The most likely habitats appear to be those with little vegetation, gravelly bottoms and brackish water. Macan (1939) also makes this observation concerning brackishness. Should *S. concinna* prove, on further investigation, to be a species which can only breed in saline habitats, a rather interesting problem will arise concerning its ability to fly considerable distances. In the greater number of papers published concerning *S. concinna* this species has always been placed in the genus *Callicorixa.* Buchanan White 1873, however, on examination of the external appearance of this species indicates that it belongs to the same group as *S. lateralis,* i.e., *Vermicorixa* Walton 1940.

Hesperocorixa moesta: Not very common, recorded from **1.**, **4.**, **6.** and **10.**, 45 were collected. This species bred in Locus *D.* of **1.** This is almost certainly the only habitat examined where *H. moesta* was breeding in the survey area. One male collected from Locus *D.* had some rather interesting variations present in certain physical features, and in some respects resembled *H. castanea.* This specimen was of normal *H. moesta* length, the strigil on the 6th

abdominal segment was the same shape as that found on *H. moesta*, but much smaller, and had the same number of combs as *H. castanea*, four to five. China (1933). The tuft of hairs was missing from the 7th abdominal segment, the frontal impression was intermediate between *H. moesta* and *H. castanea*. The length of the claws of the median leg were the same length as the tarsi. This specimen seems to fall between these two very similar species.

Hesperocorixa linnei: Common in certain habitats, recorded from all habitats other than **8**., 321 were collected. *H. linnei* was very abundant in **6**. during January, 1953, but all later collections were very much smaller. The area where it was normally found in **6**. was around the margins where the water was about eighteen inches deep, and there was no vegetation. Its appearance in other habitats was rather erratic; it is doubtful as to whether it bred anywhere other than in **6**. *H. linnei* is a species which becomes dominant in a habitat where the rate of increase of the per-cent o.m.s. is low. This Corixid is often associated with *H. sahlbergi*.

Hesperocorixa sahlbergi: Common in certain habitats like *H. linnei*, recorded from all the habitats other than **4**., 280 were collected. *H. sahlbergi* was dominant in **6**. in one end of the pond, while *H. linnei* was dominant in the other. In **8**., a woodland type pool, this species was the only Corixid which was found on every visit; it is in fact typical of such a habitat. Its scattered appearance in so many habitats in small numbers seems to indicate that this species may migrate considerably. *H. sahlbergi* kept in an aquarium were observed to be constantly flying out.

Callicorixa praeusta: Not very common, recorded from every habitat other than **8**., 32 were collected. Extremely erratic in appearance; for some reason this species seemed to favour **3**. One third of the total were found in this habitat; it is very doubtful, however, that *C. praeusta* bred there. The greater number of *C. praeusta* were found in the centre of ponds; in this respect there is a strong similarity between this species and *S. dorsalis*. *C. praeusta* seems to be a considerable migrant to judge from the number of times and habitats in which it was found and for which there is no evidence that it bred.

Micronecta scholtzi: Only recorded from **5**., where three specimens collected by the author; however, a colleague, Mr. P. N. Lawrence, found this species rather more commonly in the main body of the lake during April, 1954. The collecting undertaken by the author was in a very restricted part of the lake, where it appears *M. scholtzi* is rather scarce compared to the major area of the lake. *M. scholtzi* is a species found in habitats with a very low per cent o.m.s; Walton (1938) gives precise details of the type of habitats favoured by *M. scholtzi*; in most respects **5**. is similar to these.

Hydrometra stagnorum: Not very common, recorded from **5**. and **9**., 21 were collected. On **5**. *H. stagnorum* was confined to the very

sheltered parts of the main channel leading into the lake proper, being found in tunnels formed by grasses overhanging the bank. On **9**. it was found in rather different situations, mostly where the water was comparatively still, particularly on patches of floating algae. The scarcity of *H. stagnorum* about Barnet is almost certainly due to the absence of suitable habitats, i.e., those with plenty of marginal vegetation overhanging the water as on **5.**

Velia caprai: Very scarce, 5 were collected from **9**. It is difficult to account for the scarcity of *V. caprai*; it is regarded as one of the commonest water-bugs; Brown (1948) found it commonly about Hertford.

Microvelia reticulata: Abundant on many habitats, recorded from **4.**, **5.**, **6.**, **7** and **10.**, 58 were collected. The figures in Section I do not indicate the actual numbers or abundance of this species on a habitat. This species was very abundant amongst the *Juncus effusus* on **4.**; during May, 1954, two macropterous males were collected from this habitat. It is vitally necessary for some emergent vegetation to be present for this species to be found. On ponds examined where *M. reticulata* has been absent there has been an almost complete lack of emergent vegetation about the margins. Walton (1939) found evidence of *M. reticulata* occurring in association with *Phragmites communis.*

Mesovelia furcata: Abundant on two habitats, **2** and **10.** No actual count was even attempted at the numbers present. This species is often found in association with *Potamogeton natans.* A solitary macropterous male was found in September, 1953, on **2.** The spread of this species is almost certainly curtailed by the absence of winged forms.

Gerris lacustris: Common on most habitats, recorded from all other than **8.** and **10.** In both cases it might have been overlooked, 243 were collected. *G. lacustris* was very scarce on **1.**; this may have been due to the openness of the pond. Generally *G. lacustris* was fairly common on most ponds and on the stream. Conditions seemed to be particularly favourable on **3.** for this Gerrid, one third of the

Gerris odontogaster: Not so common as *G. lacustris,* recorded from total were from this habitat.

1., **2.**, **3.**, **4.**, **5.**, **6.**, **9.** and **10.**, 66 were collected. On some habitats this species was as common as *G. lacustris.* Those habitats where it was as common were **1.**, **2.** and **4.** On **6** *G. odontogaster* appeared to be the dominant Gerrid. It is generally assumed that these two species are found on much the same type of habitat and have a similar distribution. However, if a large number of habitats were examined in a small area and such details as the amount of emergent vegetation, type, e.g., *Glyceria, Phragmites,* etc., shade cast by trees, height of banks, per cent o.m.s. and surface tension were noted, certain distinctions would almost certainly become obvious. This is borne out when **3.**, where *G. lacustris* was dominant, is compared

with **6.**, where *G. odontogaster* was dominant. It seems probable that open habitats are unfavourable to *G. odontogaster*, i.e., **3.**, **5.**, **9.**

Gerris thoracicus: Not very common, recorded from **2.**, **5.** and **9.**, 5 were collected. Macan (1941) states that *G. thoracicus* is 'widely distributed, common and abundant'. However, all the records of survey work carried out in various parts of Britain seem to indicate otherwise. Brown (1943) comments on the possibility that *G. thoracicus* probably prefers silty habitats; its absence from **10** is thus rather curious. Brown (1948) found this Gerrid common on a pond near Hertford; this is the only record known to the author of where *G. thoracicus* has been found commonly.

Gerris gibbifera: Like *G. thoracicus*, scarce in the survey area, recorded from **3.** and **4.**, 2 were collected. This species is more typical of ditches and very small streams; both specimens were macropterous and obviously migrants.

Nepa cinerea: Fairly common, recorded from **1.**, **2.**, **4.**, **5** and **9.**, 12 adults and numerous nymphs were examined and returned to their respective habitats. *N. cinerea* was very common in **1.**, nymphs were abundant in Locus *C.*, the adults were normally found in Locus *D.* It does seem probable that the nymphs mature in one Locus because of predator pressure, which is the mainspring of all distribution. In **5.** *N. cinerea* was found in water up to about three feet deep, contrary to the usual few inches in which it normally lives. The most interesting record is that for **9.** *N. cinerea* is not the type of insect found living in streams in normal circumstances. This species was probably introduced from a large lake in Ryrham Park, from which this stream flows; it seems probable that it was carried down by the current after some particularly violent storm.

Ranatra linearis: Not very common, recorded from **2.** and **10.** Five adults and several nymphs were examined and returned to their respective habitats. In **10.** *R. linearis* was fairly common amongst the dead *Juncus* detritus around the margins. In **2.** it preferred the more open water further offshore amongst a clump of dead branches and rubbish. Neither *N. cinerea* nor *R. linearis* were recorded by Brown (1948) from any habitats about Hertford. It is of interest to record *R. linearis* from a cattle pond (**10.**), as this was rather an unusual habitat.

Plea leachi: Recorded from **4.** and **10.** The numbers in Section I only indicate its presence in a habitat; in **4.** it was often found in myriads amongst the submerged vegetation. In **10.** it did not seem to be quite so common. An interesting point about the distribution of *P. leachi* is that it is found abundantly in one pond and nowhere else commonly in a given area.

Notonecta glauca: Recorded from every habitat, 50 were collected. In every habitat other than **1.** *N. glauca* was the dominant Notonectid; probable reasons for its scarcity in **1.** were the consistently high pH reaction, and the presence of a large population of *N. obliqua*

and *N. viridis*. Habitats where *N. glauca* appeared to be breeding were **1.**, **2.**, **5.**, **6.**, **9.** and **10.**; nymphs were found in these habitats on several occasions. Figures available showing the numbers collected from ponds where it did not seem to be breeding seem to indicate that migration of a purely local character frequently took place. It is probable that each habitat had a small non-breeding population which was replenished every autumn after the maturing of the nymphs in the 'focus of *N. glauca*'. It is doubtful whether any of the investigated breeding habitats constituted a focus, as the populations were not large enough. In Aldenham Reservoir *N. glauca* was very abundant; this was possibly the focus of the species.

Notonecta obliqua: Very common in **1.**, also recorded from **2.**, **3.**, **4.** and **10.**, 161 were collected; 129 of these were from **1.** In **1.** *N. obliqua* appeared to be confined to the vegetated parts of the pond; this habitat was obviously the focus of the species in the survey area; it seems probable that most of the other recorded occurrences were immigrants from this pond. Brown (1948) found *N. obliqua* about Hertford but not very commonly. *N. obliqua* is very closely related to *N. glauca*, and in the south of France both species interbreed. In the United Kingdom, however, they appear to be fairly well separated both physiologically and ecologically.

Notonecta viridis: Moderately common, recorded from all the habitats other than **8.**, 54 were collected. Over half the material was from **1.**; this habitat was almost certainly the focus of *N. viridis* in the survey area. *N. viridis* was found to be breeding in **1.** but nowhere else. The majority of *N. viridis* collected from other habitats were found in the winter-spring period, indicating an over-wintering non-breeding population; these were almost certainly immigrants from **1.**

Notonecta maculata: Recorded only from **3.**, where 2 females were collected. *N. maculata* is usually found in habitats with a hard substratum, i.e., brick built reservoirs, E.W.S. tanks, etc. The female, instead of inserting her eggs in plant tissue, adheres them to a hard substratum. None of the habitats about Barnet appeared to have these characteristics. Walton (1936) investigated the oviposition of all four species of British *Notonecta.*

Ilyocoris cimicoides: Common, recorded from **1.**, **2.**, **3.**, **4.**, **6.**, **7.**, **9.** and **10.**, 72 were collected; many more were found in **2.** and **4.** but not collected. In **2.** *I. cimicoides* was the dominant Cryptocerate. During the winter months of 1953 large numbers were found amongst the vegetative débris of **2.** in a torpid state. In **4.** *I. cimicoides* was abundant amongst the dead leaves lining the bottom; on several occasions at least twenty specimens were found in a sweep with a hand-net. In **9.**, where it bred, the nymphs were found under stones in the faster sections of the stream and their behaviour strongly resembled *Aphelocheirus montandoni*, a species belonging to a closely related family. *(To be continued.)*

AGROMYZIDAE (DIPT.) FROM NORFOLK—I

By S. A. MANNING, F.L.S., F.R.E.S.

This paper records the occurrence of 57 species of *Agromyzidae* (Dipt.) in Norfolk.

For some years I have been interested in the mines of these and other leaf-mining insects; but I did little serious collecting until after I had obtained a copy of Prof. E. M. Hering's book, *Biology of the Leaf Miners* (1951). I was very fortunate in establishing contact with K. A. Spencer, B.A., F.R.E.S., who had prepared the English translation and was himself specializing on the *Agromyzidae*. He very kindly agreed to look at all the mines I collected and to identify those produced by *Agromyzidae*. I should like to put on record here my great appreciation of Spencer's valuable help, without which this paper would not have been produced. I am also indebted to Prof. Hering, of Berlin, for his kind help in a few difficult cases. I am personally responsible for the determinations of the names of the food-plants, which are according to Clapham, Tutin and Warburg (1952).

To save space I have divided the list into three parts. The first part concerns a few odd mines collected before 1955.

Liriomyza centaureae Hg. Mines on leaves of *Centaurea nigra* L. Ssp. *nemoralis* (Jord.) Gugl., Crostwick, E. Norfolk, 25th August, 1950, and 31st July, 1951.

Phytagromyza lonicerae (R.-D.). Mines on leaves of *Lonicera periclymenum* L., Old Buckenham, E. Norfolk, 18th May, 1949.

Napomyza glechomae (Kalt.). Mines on leaves of *Glechoma hederacea* L. Old Buckenham, February, 1949.

Phytomyza atricornis Mg. Mines on leaves of *Taraxacum* sp., Crostwick, 27th August, 1950.

P. crassiseta Zett. Mines on leaves of *Veronica chamaedrys* L., Costessey, E. Norfolk, 25th August, 1951; Crostwick, 31st July, 1952.

P. ilicis Curt. Mines on leaves of *Ilex aquifolium* L., Caston, W. Norfolk, January, 1953.

P. lappina Gour. Mines on leaves of *Arctium vulgare* (Hill), A. H. Evans, Old Buckenham, 21st July, 1949.

P. obscurella Fall. Mines on leaves of *Aegopodium podagraria* L., Beeston Regis, E. Norfolk, 26th November, 1948.

P. ranunculi (Schrk.). Mines on leaves of *Ranunculus repens* L., Old Buckenham, 2nd June, 1949.

P. sonchi R.-D. Mines on leaves of *Lapsana communis* L., Old Buckenham, 24th June, 1949.

The second part includes *Agromyzidae* whose mines were found by Spencer and myself at Horsford Heath, E. Norfolk, on 12th August, 1955. We also found mines of *Phytomyza tanaceti* Hd. on *Tanacetum vulgare* L. at Hevingham, E. Norfolk, on the same date.

Insect.	*Food-plant.*
Agromyza alnibetulae Hd.	*Betula pubescens* Ehrh.
A. nana Mg.	*Trifolium* sp.
A. spiraeae Kalt.	*Filipendula ulmaria* (L.) Maxim.
Liriomyza centaureae Hg.	*Centaurea nigra* L. agg.
Phytagromyza hendeliana Hg.	*Lonicera periclymenum* L.
Phytomyza angelicastri Hg.	*Angelica sylvestris* L.
P. crassiseta Zett.	*Veronica chamaedrys* L.
P. ilicis Curt.	*Ilex aquifolium* L.
P. obscura Hd.	*Mentha* sp.
P. ramosa Hd.	*Succisa pratensis* Moench.
P. ranunculi (Schrk.).	*Ranunculus repens* L.
P. sphondylii R.-D.	*Heracleum sphondylium* L.

The third part includes insects whose mines were found in the Earlham Park area of Norwich, E. Norfolk, during 1955. My collecting in this part of Norwich included many visits to Earlham Park and the neighbouring marshes, hedgerows and waste ground in Bluebell Road, and my garden.

Agromyza albipennis Mg. Mines on *Phragmites communis* Trin., 10th August.

A. anthracina Mg. Mines on *Urtica dioica* L., 2nd July.

A. flaviceps Hd. Mines on *Humulus lupulus* L., 9th July and August.

A. nana Mg. Mines on *Trifolium repens* L., 27th June; larva active in mine on *Trifolium* sp., 2nd August.

A. reptans Fall. Mines on *Urtica dioica* L., 6th August.

A. spiraeae Kalt. Mines on *Filipendula ulmaria* (L.) Maxim., 1st July; mines on *Geum urbanum* L., 12th July; mines on *Potentilla reptans* L., 10th August.

Phytobia artemisiae (Kalt.). Larva active in mine on *Eupatorium cannabinum* L., 2nd August; mines on *Artemisia vulgaris* L., 6th August.

P. flavifrons (Mg.). Mines on cultivated *Dianthus barbatus* L., 12th September; mines on *Melandrium album* (Mill.) Garcke, 19th July; mines on *Melandrium rubrum* (Weig.) Garcke, 9th August; mines on *Silene cucubalus* Wibel., 20th August.

P. iraeos (R.-D.). Mines on *Iris pseudacorus* L., 9th August.

P. labiatarum (Hd.). Mines on *Ballota nigra* L., 6th August (first instar); mines on *Lamium album* L., 12th July; mines on *Stachys sylvatica* L., 2nd July, larvae active in mines on the same food-plant, 9th August.

P. pygmaea (Mg.). Probably the mine of this insect on *Phalaris arundinacea* L., 23rd June; mines on the same food-plant, 2nd July; four pupae removed from a mine on a grass (most probably *Agropyron caninum* (L.) Beauv.) growing at the shady margin of a wood, 9th August.

P. verbasci (Bché). Mines on *Scrophularia aquatica* L. growing at the shady edge of a wood, 9th August (Figwort plants at the nearby river's edge were not mined); mines on *Verbascum thapsus* L., 20th August.

Liriomyza amoena (Mg.). Mines on *Sambucus nigra* L., 22nd August.

L. artemisicola de Meij. Mines on *Artemisia vulgaris* L., 11th August.

L. eupatoriana Spencer. Mines on *Eupatorium cannabinum* L., 17th August.

L. fasciola (Mg.). Mines on *Bellis perennis* L., 2nd August; larvae active in mines on the same food-plant, 16th August.

L. pusio (Mg.). Mines on *Tragopogon pratensis* L. Ssp. *minor* (Mill.) Rouy., 19th August.

L. sonchi Hd. Mines on *Sonchus asper* (L.) Hill., 27th August.

L. strigata (Mg.). Mines on *Eupatorium cannabinum* L., 6th August; mines on *Taraxacum* sp., 17th August.

L. taraxaci Hd. Mines on *Leontodon autumnalis* L., 19th August; mines on *Taraxacum* sp., 9th September.

L. trifolii (Burg.). Mines on *Trifolium* sp., 2nd August.

L. valerianae Hd. Mines on *Valeriana officinalis* L., 30th July.

Phytagromyza hendeliana Hg. Mines on *Lonicera periclymenum* L., 14th June.

P. populi (Kalt.). Pupae in mines on *Populus* x *canadensis* Moench var. *serotina* (Hartig) Rehder, 17th August.

P. tridentata (Lw.), Mines on *Salix alba* L., 19th August. A species mining *Salix triandra* L., 27th August, has been provisionally referred to *P. tridentata* (Lw.) by Prof. Hering, but mines are by no means typical of this species, and I shall endeavour to check by breeding in 1956.

Napomyza glechomae (Kalt.). Mines on *Glechoma hederacea* L., 24th May, 25th June, 30th August.

Phytomyza affinis Fall. Mines on *Cirsium* sp., 9th August.

P. agromyzina Mg. Mines on *Cornus sanguinea* L., 28th July.

P. albiceps Mg. Mines on *Artemisia vulgaris* L., 6th August.

P. angelicae Kalt. Mines on *Angelica sylvestris* L., 16th June. 16th August.

P. angelicastri Hg. Mines on *Angelica sylvestris* L., 15th August.

P. anthrisci Hd. Mines on *Anthriscus sylvestris* (L.) Bernh., 13th June.

P. atricornis Mg. Mines on *Arctium* sp., 2nd July, 15th August (pupae present); mines on *Artemisia vulgaris* L., 27th June; mines on cultivated *Aster* sp. 13th July; mines on cultivated Chrysanthemums, 30th June; mines on *Cirsium vulgare* (Savi) Ten., 10th August (pupae present); mines on cultivated *Erigeron* sp., 18th July; mines on *Eupatorium cannabinum* L., 18th July, 2nd August (pupae present); mines on cultivated *Gaillardia*, 30th June; mines on culti-

vated *Lupinus,* 30th June; mines on cultivated *Pisum sativum* L., 30th June; mines on *Senecio aquaticus* Hill, 6th August; mines on *Senecio jacobaea* L., 4th August; 2nd August (pupa present); mines on *Senecio vulgaris* L., 30th June; mines on *Sisymbrium officinale* (L.) Scop. 25th July; mines on *Sonchus* sp., 30th June; mines on *Taraxacum* sp., 6th June.

P. calthophila Hg. Mines on upper leaves of *Caltha palustris* L., 25th June, 9th August (larvae active in the mines).

P. cirsii Hd. Mines on *Cirsium palustre* (L.) Scop., 11th August.

P. eupatorii Hd. Mines on *Eupatorium cannabinum* L., 6th August.

P. ilicis Curt. Mines on *Ilex aquifolium* L., April.

P. lappae R.-D. Mines on *Arctium* sp. 19th July, 9th August (pupae present in mines).

P. matricariae Hd. Mines on *Achillea millefolium* L., 9th September; mines on *Matricaria matricarioides* (Less.) Porter, 26th August.

P. minuscula Gour. Mines on *Thalictrum flavum* L., August. On 17th August mines contained active larvae and pupae were found on the underside of leaves.

P. nigra Mg. Mines on *Holcus lanatus* L., 19th July.

P. obscura Hd. Mines on *Mentha* sp., 25th July.

P. obscurella Fall. Mines on *Aegopodium podagraria* L., 2nd July.

P. primulae R.-D. Mines on *Primula veris* L., 29th June.

P. ranunculi (Schrk.). Mines on *Ranunculus repens* L., 13th June; mines on *Ranunculus acris* L., 24th May.

P. sonchi R.-D. Mines on *Hypochaeris radicata* L., 22nd August; mines on *Lapsana communis* L., 7th July.

P. sphondyllii R.-D. Mines on *Heracleum sphondylium* L., 14th June.

P. taraxaci Hd. Mines on *Taraxacum* sp. 22nd July, 6th August.

P. tordylii Hd. Mines on *Torilis japonica* (Houtt.) DC., 21st June.

Phytomyza sp. Mines on *Centaurea nigra* L. Ssp. *memoralis* (Jord.) Gugl., 20th August.

REFERENCES

CLAPHAM, A. R., TUTIN, T. G. & **WARBURG, E. F.,** 1952. *Flora of the British Isles.* Cambridge. University Press.

HERING, E. M., 1951. *Biology of the Leaf Miners.* The Hague. Uitgeverij. Dr. W. Junk.

249 The Avenues,
Norwich, Norfolk.
28th December, 1955.

BOOK REVIEWS

Soil Zoology. Edited by D. K. McE. Kevan, 1955. pp. xiv, 512. Illustrated. London. Butterworths. Cloth. Price £2 15s.

Dr. Kevan must be heartily congratulated on editing this stimulating and well produced volume of essays on the new and rapidly developing subject of soil zoology. The book comprises fifty papers contributed to the Second Easter School in the University of Nottingham School of Agriculture in March, 1955. It is a remarkable tribute to the Editor that such a substantial volume (512 pages; 296 figures; 23 pages of indices) should be produced so rapidly, and that he should have contributed as a long (36-page) appendix a 'practical key to the orders and suborders of soil and litter inhabiting animals', which appears to be most useful and should help to stimulate work on the soil fauna by those primarily working on other aspects of soil science.

Most zoologists not already familiar with recent developments in the field of soil zoology will find this volume fascinating, and it should make them interested in finding out more about the subject. A book in English on the soil fauna is long overdue. The fact that the discussion that took place after each paper is published increases the interest and often spotlights the problems which need attention. Few will read the book and find that no new ideas have been generated. It is clear from the many problems raised that the study of the soil fauna has been relatively neglected, and zoologists, whether they tend to be morphologically, physiologically or ecologically inclined, will find ample scope for their talents in the study of the animals which inhabit the soil.

The book is divided into two parts, the first being headed 'General' and containing five sections: (1) Introductory papers (six in number); (2) Pedology (two); (3) Ecology (eight); (4) applied aspects (seven); (5) Zoophagous fungi (two). The second part is concerned with methods and contains four sections: (1) Sampling and estimation (14 papers); (2) Culture methods (two); (3) Preparations (six); (4) Physiology (three). This outline of the contents gives the best indication of the scope of the volume that it is possible to do in the course of a review as brief as this must be. The widespread concern with sampling and extraction methods is interesting and many of the general papers emphasize how much the technique used may affect the estimate made of the total population density in a given soil. No single extraction method will remove all the animals present in any soil.

It would, I think, be invidious to select individual papers for detailed consideration when it is not possible to deal with every contribution. The 1955 Easter School at Nottingham must have been a remarkably interesting one, and those of us who were not privileged

to attend it will, as I am sure will those that did attend it, give this book a very warm welcome. Every zoologist will profit by reading it and many will want to own a copy.

FERGUS J. O'ROURKE.

A Manual of the Dragonflies of North America (Anisoptera) including the Greater Antilles and the Provinces of the Mexican Border, by James G. Needham and Minter J. Westfall, Jnr. 1955. 8vo., 12 x 615 pp., 1 coloured plate and 341 figs. California University Press, Berkeley and Los Angeles. Price £4 14s.

This work is divided into two parts. The first gives a brief description of the external features of the structure of adults and larvae, a general introduction to the Odonata, collecting, preserving and the breeding of dragonflies. An accented list of the genera and species is provided. The 'Comstock-Needham' nomenclature based on the theory of pre-tracheation has been adopted for venation. We would have preferred 'segments' instead of 'joints' used throughout when describing the antennae and tarsi. The three thoracic sutures of the synthorax known as the 'humeral', '1st lateral' and '2nd lateral' have been renamed the '1st', '2nd' and '3rd lateral sutures'. This is unfortunate, as nothing but confusion can result when the thoracic pattern is considered.

The second and major part consists of a systematic classification of the 332 species. Keys are provided to families, sub-families, genera and species, also to the larvae when known. With regard to the latter, it is gratifying to note that the early stages have of late received far more attention than by earlier workers. The Keys have been constructed with care and are augmented with 22 tables for quick identification. Haphazard identifications have proved that the Keys really work. Each genus has a representative illustrated by the wings of a male, also a photograph of an adult larva in all but four genera. Each species is briefly but adequately described, the distribution and date of flight being included. A glossary, list of synonyms and index complete this work.

The authors are to be congratulated on condensing so much information in the space available. The illustrations have been selected with care and are of a very high standard. The photographs of larvae and male genitalia, executed by the junior author, cannot but arouse the greatest admiration. Both the layout and printing of this volume leave nothing to be desired and, although costly, this work fully justifies the price.

A.E.G.

Published 12th July, 1956.